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JOINT CHINOOK TECHNICAL COMMITTEE REPORT

2010 ANNUAL REPORT OF CATCHES AND ESCAPEMENTS

REPORT TCCHINOOK (11)-2

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LIST OF ACRONYMS WITH DEFINITIONS

AABM	Aggregate Abundance Based Management
AC	Allowable Catch
AI	Abundance Index
ADF&G	Alaska Department of Fish & Game
AEQ	Adult Equivalent
Agreement	June 30, 1999 PST Annex and the related Agreement
AUC	Area Under the Curve
AWG	Analytical Working Group of the CTC
BCAFC	British Columbia Aboriginal Fisheries Commission
BTR	Base Terminal Run
C&S	Ceremonial & Subsistence
CBC	Central British Columbia Fishing area – Kitimat to Cape Caution
CCMP	Comprehensive Chinook Management Plan
CDFO	Canadian Department of Fisheries & Oceans
CI	Confidence Interval
CNR	Chinook Non-retention
CR	Columbia River
CRITFC	Columbia River Intertribal Fish Commission
CRFMP	Columbia River Fishery Management Plan
CTC	Chinook Technical Committee
CUS	Columbia Upriver Spring Chinook stock
CWT	Coded Wire Tag
DIT	Double Index Tag
ESA	U S Endangered Species Act
Est+fw	Estuary Plus Fresh Water Area
FL	Fork Length
FMP	PFMC Framework Management Plan
FNC	First Nations Caucus
FOG	Fisheries Operational Guidelines
FR	Fraser River
GCG	Gene Conservation Group
GW	Gitwinksihlkw
GS	Strait of Georgia
HOR	Hatchery Origin Returns
IDFG	Idaho Department of Fish & Game
IDL	InterDam Loss
IM	Incidental Mortality
ISBM	Individual stock based management
LFR	Lower Fraser River
LGS	Lower Strait of Georgia
mar	Marine Area
mar+fw	Marine Plus Fresh Water Area
MOC	Mid Oregon Coast
MRP	Mark-Recovery Program
MSF	Mark-Selective Fishery
MSH	Maximum sustainable harvest
MSY	Maximum Sustainable Yield for a stock, in adult equivalents
MSY ER	Exploitation Rate sustainable at the escapement goal for a stock, in AEQs
NA	Not Available
NBC	Northern British Columbia Dixon Entrance to Kitimat including Queen Charlotte Islands
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NOC	Oregon Coastal North Migrating Stocks
NPS	North Puget Sound
NPS-S/F	North Puget Sound Summer/Fall Chinook stock
NR	Not Representative
NWIFC	Northwest Indian Fisheries Commission
ODFW	Oregon Department of Fish & Wildlife
PFMC	Pacific Fisheries Management Council
PS	Puget Sound
PSC	Pacific Salmon Commission
PSARC	Pacific Scientific Advice Review Committee
PSMFC	Pacific States Marine Fisheries Commission
PST	Pacific Salmon Treaty
QDNR	Quinault Department of Natural Resources, Division of fisheries
QIN	Quinault Nation
QCI	Queen Charlotte Islands
RER	Recovery Exploitation Rate
S_{MSY}	Escapement producing MSY
SEAK	Southeast Alaska Cape Suckling to Dixon Entrance
SG	Strait of Georgia
SPS	South Puget Sound
SWVI	Southwest Vancouver Island
TAC	Technical Advisory Committee
TBR	Transboundary Rivers
TTC	Transboundary Technical Committee
UAF	University of Alaska Fairbanks
UFR	Upper Fraser River
UGS	Upper Strait of Georgia
USCTC	U S members of the CTC
USFWS	U S Fish & Wildlife Service
UW	University of Washington
WA/OR	Ocean areas off Washington and Oregon North of Cape Falcon
WAC	Washington Coast (Grays Harbor northward)
WACO	Washington, Oregon, Columbia River Chinook stock group
WCVI	West Coast Vancouver Island excluding Area 20
WDFW	Washington Department of Fisheries and Wildlife

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EXECUTIVE SUMMARY

The June 30, 1999, Pacific Salmon Treaty (PST) Annexes and Related Agreements (Agreement) substantially changed the objectives and structure of the Pacific Salmon Commission's (PSC) Chinook salmon fisheries and assessment of Chinook salmon stocks. The 1999 Agreement replaced the previous ceiling and pass-through fisheries with Aggregate Abundance Based Management (AABM) and Individual Stock Based Management (ISBM) fisheries. The 2008 Agreement replaced the 1999 Agreement and assigned the Chinook Technical Committee (CTC) with several tasks related to implementation of the Agreement (Appendix to Annex IV, Chapter 3).

This report summarizes the 2009 fishery catches by region, available estimates of incidental mortality by fishery and limited commentary on fishery catches where needed. Landed catch is reported in the appendices for each geographic area covered under the PST. An assessment of escapement for stocks with CTC accepted goals is included, and escapement data through 2009 are provided for all escapement indicator stocks.

The escapements of 50 naturally spawning escapement indicator stocks/stock aggregates are reviewed annually. Biologically-based escapement goals have been accepted by the CTC for 24 of the 50 escapement indicator stocks/stock aggregates. For 12 of these, the escapement goal is defined as a range; for the remaining 12, the escapement goal is the point estimate of S_{MSY} (escapement producing maximum sustained yield). In 2009, escapements were within the goal range for 3 stocks, above the range or S_{MSY} point estimate for eight stocks, and below the goal for 14 stocks. Data for stocks without accepted goals are presented to illustrate trends in escapement. The CTC will continue to review escapement goals, as they are provided to the committee.

1 CHINOOK CATCH

The June 30, 1999, Pacific Salmon Treaty (PST) Annexes and Related Agreements (Agreement) substantially changed the objectives and structure of the Pacific Salmon Commission's (PSC) Chinook salmon fisheries. The 1999 Agreement eliminated the previous ceiling and pass-through fisheries and replaced them with Aggregate Abundance Based Management (AABM) and Individual Stock Based Management (ISBM) fisheries. The 2008 Agreement defines catch limits for AABM fisheries; and ISBM fisheries are limited by adult equivalent mortality rates. Chinook salmon catches for the AABM fisheries in 2009 are summarized in Table 1.1-Table 1.4. Historical catches for PSC Chinook salmon fisheries are given in Appendices A.1-A.14.

Starting with the report CTC (2004a), the Chinook Technical Committee included estimates of incidental mortalities associated with landed catch for each component of each AABM fishery and most ISBM fisheries (CTC 2004b). Limited commentary on both AABM and ISBM fisheries is also provided.

1.1 REVIEW OF AABM FISHERIES

AABM fisheries for Chinook salmon are managed to achieve a target catch corresponding to a target harvest rate index and each year's abundance index (AI) in Table 1 of the Agreement. AABM fisheries are mixed stock salmon fisheries that intercept and harvest migratory Chinook salmon from many stocks. The AABM fisheries (Annex IV, Chapter 3, paragraph 2) are:

1) Southeast Alaska (SEAK) All Gear,
2) Northern BC (NBC) Troll and Queen Charlotte Islands (QCI) sport, and
3) West Coast Vancouver Island (WCVI) Troll and Outside Sport.

Catches for these three fisheries are reported in Table 1.1.

Table 1.1. Annual catches and hatchery add-ons for the AABM fisheries, in thousands of Chinook salmon. The Treaty catches do not include the add-on or exclusions(see Section 1.1.1 and Appendix A.1). Notation is T for Troll, N for Net and S for sport.

Year	SEAK (T, N, S)			NBC (T), QCI (S)		WCVI (T, S)	
	Treaty Catch		Hatchery Add-on	Treaty Catch		Treaty Catch	
	Limit[1]	Observed		Limit[1]	Observed	Limit[1]	Observed
1999	184.2	198.8	47.7	126.1	86.7	107.0	36.4
2000	178.5	186.5	74.3	123.5	31.9	86.2	101.4
2001	250.3	186.9	77.3	158.9	43.5	145.5	117.7
2002	371.9	357.1	68.2	237.8	150.1	196.8	165.0
2003	439.6	380.2[2]	57.2[2]	277.2	191.7	268.9	175.8
2004	418.3	417.0	76.0	267.0	241.5	209.6	216.6
2005	387.4	387.7[3]	65.3[3]	240.7	243.6	179.7	202.7
2006	354.5	358.6[3]	49.1[3]	200.0	216.0	145.5	146.9
2007	329.4	328.4[3]	69.6[3]	143.0	144.2	121.9	139.2
2008	152.9	172.3[3]	68.2[3]	120.9	95.6	136.9	143.8
2009[4]	176.0	229.5	65.2	139.1	109.5	91.3	124.6
2010	221.8			152.1		143.7	

[1] Allowable treaty catches correspond to the postseason AIs for 1999-2009 and the preseason AI for 2010.

[2] Values reverted back to original values published in TCCHINOOK05-2.

[3] Values changed due to correction in the accounting of the TBR terminal exclusion.

[4] 2009 was the beginning of the 2008 Agreement

1.1.1 Southeast Alaska Fisheries

The SEAK Chinook salmon fishery has been managed to achieve the annual all-gear PSC allowable catch through a plan established by the Alaska Board of Fisheries. Once the all-gear allowable catch is determined from the preseason AI each spring, this plan establishes gear quotas for the troll, net, and sport fisheries. The allocation plan reserves 4.3% of the total PSC catch for purse seine, 2.9% for drift gillnet and 1,000 fish for set gillnet fisheries. After the net quotas are subtracted, 80% of the remainder is reserved for troll gear and 20% for the sport fishery. The sport fishery is managed in-season with bag-limits and other constraints. Regulatory history and maps for each SEAK fishery are detailed in CTC (2004b).

In addition, the SEAK fisheries were managed for:

1) An Alaskan hatchery add-on estimated from CWT sampling. The add-on is the total estimated Alaskan hatchery harvest, minus 5,000 base-period Alaskan hatchery harvest, and minus one-half of the 90% confidence interval for the total Alaskan hatchery harvest.
2) An exclusion of wild Chinook salmon originating from the Stikine and Taku River.
3) Compliance with provisions established by the National Marine Fisheries Service in accordance with the U.S. Endangered Species Act (ESA).
4) Consistency with the provisions of the PST as required by the Salmon Fishery Management Plan of the North Pacific Fishery Management Council that was established by the U.S. Magnuson-Stevens Act.

The 2009 pre-season AI of 1.33 allowed an all-gear catch of 218,800 fish. The all gear harvest was 299,346, comprised of a Treaty catch of 229,509, an add-on of 65,179, and terminal exclusion catch of 4,658 Chinook salmon. A breakdown by gear for total catch, Alaskan hatchery contributions and terminal exclusions is detailed in Table 1.2. Historical harvests for 1975-2009 for SEAK are in Appendix A.1.

1.1.1.1 Troll Fisheries Harvest

Troll fishery regulations in 2009 were similar to those in 2008. The accounting year began with the start of the winter fishery on October 11, 2008 and ended the following September, 2009. The winter fishery continues until 45,000 Chinook salmon are caught or through April 30, whichever is earlier. In 2009, the harvest in the winter fishery was less than 45,000 and the winter troll fishery was closed on April 30. The spring fisheries were managed so that each fishery would not exceed a predetermined number of non-Alaskan Chinook salmon based on the Alaskan hatchery percentage in each of the small fisheries. The first summer fishery opening began on July 1 and was managed to harvest 70% of the remaining troll gear Chinook salmon quota based on the pre-season AI. After the first 70% of the summer quota was harvested, the troll fishery was closed to Chinook salmon retention and the areas of high Chinook abundance were closed while the fishery was directed primarily onto coho salmon (in recent years, a large portion of the troll fleet has also targeted on chum salmon). No in-season adjustment of the AI was made because the results using the methodology established by the CTC and used since 1997 were poorly correlated with the first post-season calibration. A second summer Chinook salmon retention period began in August to catch the remaining 30% of the summer quota.. The areas of high Chinook salmon abundance remained closed during this second summer Chinook retention period.

In 2009, the troll fishery harvested 175,644 Chinook salmon, including 20,522 Alaskan hatchery fish. Subtracting an Alaska hatchery add-on of 16,602 results in a treaty catch of 159,042 (Table 1.2). The winter fishery harvested 24,889 of which 2,756 were from Alaskan hatcheries, with a total of 22,664 treaty fish. The spring fishery harvested a total of 32,859 of which 12,542 were Alaskan hatchery fish and 22,699 were treaty fish. The total summer harvest was 117,896 of which 5,224 were from Alaskan hatcheries and 113,679 were treaty fish.

1.1.1.2 Net Fisheries Harvest

Net harvest of Chinook salmon in the purse seine fishery is limited by a 28" (71 cm) minimum size limit and the use of Chinook salmon non-retention (CNR) regulations. Chinook salmon between 21" and 28" may never be sold, while Chinook salmon below 21" may be retained at all times. Gillnet harvest of Chinook salmon is limited by a delayed season opening in late June unless directed fisheries are implemented for stocks of Chinook salmon bound for the Taku and Stikine Rivers. Directed fisheries were in place in 2009 for Taku River Chinook salmon, but did not occur for Stikine River Chinook salmon in 2009.

The 2009 total net harvest was 54,137 Chinook salmon (Table 1.2). There was a total of 4,658 fish excluded from the gillnet harvest and 28,781 Chinook salmon were from Alaskan hatcheries. The total net treaty harvest was 22,378 Chinook salmon. The treaty harvest by gear type was 1,533 for set gillnet, 7,254 for drift gillnet and 13,591 for purse seine.

1.1.1.3 Recreational Fishery Harvest

In 2009, the recreational fishery had a two fish daily bag limit for all residents. Non-resident anglers had a one fish daily and a three fish annual limit. The minimum size limit of 28" in total length was in effect for both resident and non-resident anglers throughout the season. In "terminal" areas near hatchery release sites, however, bag and size limit regulations were liberalized to provide for increased harvests of returning Alaskan hatchery Chinook salmon. Preliminary recreational harvests are estimated in-season by creel surveys throughout the region, and final harvest numbers are estimated one year later using results from the mail out Statewide Harvest Survey (SWHS). Sampling programs are in place to recover coded-wire tagged Chinook salmon. The Alaska hatchery contribution is determined from the CWT sampling program. The final total harvest in 2009 was 69,565 Chinook salmon with 24,988 being Alaskan hatchery fish (Table 1.2). The total sport harvest of 69,565 minus the 21,476 hatchery add-on resulted in a treaty harvest of 48,089 Chinook salmon.

Table 1.2. Harvest of Chinook salmon in SEAK by gear type in 2009.

Gear	Total Harvest	Alaskan Hatchery Harvest	Alaskan Hatchery Add-on	Catch Exclusion[1]	Treaty Catch
Troll					
Winter	24,889	2,756	2,225	0	22,664
Spring	32,859	12,542	10,160	0	22,699
Summer	117,896	5,224	4,217	0	113,679
Troll subtotal	175,644	20,522	16,602	0	159,042
Sport	69,565	24,988	21,476	0	48,089
Net					
Set Net	1,533	0	0	0	1,533
Driftnet	23,592	12,808	11,680	4,658	7,254
Seine	29,012	15,973	15,421	0	13,591
Net subtotal	54,137	28,781	27,101	4,658	22,378
Total	299,346	74,291	65,179	4,658	229,509

[1] Exclusion catch is a result of the harvest sharing arrangement on the Taku and Stikine Rivers.

1.1.2 British Columbia Fisheries

Under the 1999 PST Agreement, aggregate abundance based management regimes ("AABM") were implemented to constrain catch. This agreement extended through 2008 and was renewed in the 2009 PST Agreement to 2018. The NBC AABM fishery was defined to include NBC troll catch in Statistical Areas 1-5 and QCI sport catch in Statistical Areas 1 and 2. The total NBC AABM catch in 2009 was 109,470. The WCVI AABM fishery includes the WCVI troll and a portion of the WCVI Chinook salmon sport fishery (defined below). The total WCVI AABM landed catch in 2009 was 124,617 (Table 1.3). Troll catches from 1996-2004 have been updated with data from the Catch Finalization Project.

1.1.2.1 NBC Troll Fishery Harvest

The NBC troll fishery landed 75,470 Chinook salmon in 2009. The North Coast B.C. troll fishery was opened for Chinook salmon fishing from 15 June to 3 August and from 22 August to 30 September. The entire 2009 NBC Troll fishery was conducted under a system of individual transferable quotas. A total of 284 vessels were licensed for the NBC Troll fishery. All licences were activated but the harvest was conducted by a total of 147 vessels as much of the quota was transferred. Barbless hooks and revival boxes were mandatory in the troll fishery and the minimum size limit was 67 cm. No troll test fisheries were conducted in the North Coast of B.C. in 2009. A ribbon boundary around Langara Island and from Skonun Point to Cape Knox on Graham Island excluded the commercial troll fishery from areas within one nautical mile of the shore up to 14 September when the restriction was removed.

Table 1.3 Summary of landed catch by gear for Canadian AABM fisheries in 2009.

AABM Fishery	**Troll**	**Sport**	**Total**
NBC	75,470	34,000	109,470
WCVI	58,191	66,426	124,617

1.1.2.2 NBC and CBC Sport Fishery Harvest

Tidal recreational fisheries in NBC and CBC (marine Statistical Areas 1-11) are managed under one set of regulations (45 cm minimum size limit; two Chinook per day and four in possession; annual bag limit of 30). During the decade up to 2008, recreational fisheries in the marine areas of NBC and CBC expanded substantially. Management of these marine recreational fisheries now recognizes two regions: QCI, and the coastal mainland. Only the QCI recreational catch is included in the AABM totals. Since 1995, catches in the QCI recreational fisheries have been estimated by creel surveys, lodge logbook programs and independent observations by CDFO staff. Catch for this fishery in 2009 was 34,000 Chinook salmon. The total NBC AABM catch (troll plus sport) between October 1, 2008 and September 30, 2009 was 109,470 Chinook salmon (Table 1.3).

1.1.2.3 West Coast Vancouver Island AABM

Under the 2008 PST Agreement, the WCVI AABM fishery includes the WCVI troll and the outside WCVI sport fishery (defined below). The total AABM landed catch (First Nations troll, commercial troll, and outside tidal sport) in 2009 was 124,617 Chinook salmon (Table 1.3).

1.1.2.3.1 WCVI Troll Fishery Harvest

The AABM troll catch includes the commercial and First Nations troll caught Chinook salmon in Statistical Areas 21, 23-27, and 121-127. In the 2009 season (October 1, 2007-September 30, 2008), the WCVI troll fishing opportunities were consistent with a CDFO commitment to evaluate winter fisheries as a means to improve the economic base for the fleet and local communities while increasing flexibility in harvest opportunities and reducing the harvest rates on stocks encountered in summer fisheries (Table 1.4). Troll fishery openings were shaped by conservation concerns for Fraser River Spring Run Age 1.2 and Fraser River Spring Run Age 1.3, WCVI and Lower Strait of Georgia (LGS) Chinook salmon and interior Fraser River Coho salmon.

To reduce impacts on early spring-run Fraser and LGS Chinook salmon, SWVI areas 123-124 were closed from mid-March to mid-April. To reduce impacts on interior Coho, Coho non-retention remained in effect for the spring/summer period, Fraser Coho encounter rates were monitored, and commercial fisheries were closed from late June until late July. To reduce impacts on WCVI Chinook salmon, summer fisheries were limited to 10,000 Chinook salmon, and the July to September fisheries were conducted 5 nautical miles seaward of the surfline. To reduce impacts on LGS Chinook salmon, harvest levels were reduced during the spring period when recent impacts were highest (by reducing the TAC by 20%). The April catch was reduced from 57,063 in 2005 to 3,616 in 2009. May Chinook salmon catch in 2009 was 18,062 and within the 2005-2006 range (26,655 in 2005; 7,078 in 2006). This measure also provides some benefits to spring run US Chinook salmon stocks when the mature run is abundant on the WCVI. Statistical Area 121 (the southern bank area) remained closed in 2009. Selective fishing practices were mandatory, including single barbless hooks and "revival tanks" for resuscitating Coho salmon prior to release. The minimum size limits for commercial troll for all periods was 55 cm (fork length). The majority of catch from November through March came from Area 126.

The catches for 2009 commercial troll fisheries between October 1, 2008 and September 30, 2009 were 53,191 Chinook salmon (Table 1.4). WCVI First Nations caught an estimated 5,000 Chinook salmon in 2009. Therefore, the total WCVI AABM troll catch for 2009 was 58,191 with 345 legal and 4,117 sublegal Chinook salmon releases (not including releases from the WCVI First Nations troll fisheries, which are currently unknown).

Table 1.4 Fishing periods and Chinook salmon harvested and released during the 2009 accounting year in the WCVI commercial troll fishery.

Fishing Period	Areas Open	Area Predominately Fished	Landed Catch	Legal Release	Sub-legal releases
Oct 16-20, 2008	Areas 123, 124, 125, 126, 127	123/126	1,882	0	758
Nov 6-17, 2008	Areas 123, 124, 125, 126, 127	126	1,209	4	153
Dec 2-3, 2008	Areas 23, 24, 25, 26, 27, 123, 124, 125, 126, 127	126	1,107	0	136
Jan 6-31, 2009	Areas 23, 24, 25, 26, 27, 123, 124, 125, 126, 127	126	3,394	0	351
Feb 1-28, 2009	Areas 23, 24, 25, 26, 27, 123, 124, 125, 126, 127	126	1,540	2	132
March 1-15, 2009	Areas 23, 24, 25, 26, 27, 125, 126, 127	126	586	1	12
Apr 20-30, 2009	Areas 23, 24, 25, 26, 27, 125, 126, 127	126	3,616	0	87
May 1-6, 2009	Areas 23, 24, 25, 26, 27, 124, 125, 126, 127	126/127	194	0	9
May 7-14, 2009	Areas 23, 24, 25, 26, 27, 123, 124, 125, 126, 127	123	5,676	14	251
May 15-21, 2009	Areas 23, 24, 25, 26, 27, 123, 124, 125, 126, 127	123	11,918	47	818
May 22-24, 2009	Areas 25, 26, 27, 125, 126, 127	126/127	274	0	5
Jun 2-8, 2009	Areas 24, 25, 26, 27, 124, 125, 126, 127	124	12,165	28	1,141
Aug 8-10, 2009	Areas 123, 124, 125, 126, 127	123	9,630	38	763
Sep 9-14, 2009[1]	Area 123	123	0	211	259
TOTAL			**53,191**	**345**	**4,117**

Note: WCVI troll fisheries were generally closed from mid June to late August to avoid encounters of interior Fraser River and Thompson River Coho and WCVI Chinook salmon.

[1] DNA sampling of sublegal Chinook salmon by Area G.

1.1.2.3.2 WCVI Recreational Fishery Harvest

The AABM recreational fishery includes all catch in northwest WCVI (Areas 25–27, 125-127; Figure 1) between October 16 through June 30, and the catch outside of one NM offshore from July 1 through October 15, plus all the catch in southwest WCVI (Areas 21–24) between October

16 through July 31, and outside one NM offshore from August 1 to October 15. Catch inside the surf line and outside the AABM periods specified above is included in ISBM fishery catch.

The outer WCVI sport fishery occurs primarily in the Barkley Sound, outer Clayoquot Sound, and Nootka Sound areas. The majority of fishing effort occurs from mid-July to September in NWVI and August through mid-September in the SWVI. Creel surveys were conducted from early June to mid September. For the outside sport fishery the Chinook salmon daily bag limit was two Chinook salmon greater than 45 cm. Barbless hooks were mandatory.

The 2009 WCVI AABM sport catch estimate during the creel period was 66,426 Chinook salmon (Table 1.5). Catch rates were determined from anglers interviewed June 1 to September 15. No creel surveys occurred between the months of October and May, when effort is relatively low.

Table 1.5 Outer WCVI AABM sport fishery catches of Chinook salmon by Pacific Fishery Management Areas in 2009 representing catch from June 1 to September 15 only.

Pacific Fishery Management Areas						
21/121	**23/123**	**24/124**	**25/125**	**26/126**	**27/127**	**Total**
6,547	34,353	9,558	5,693	4,139	6,137	66,426

1.2 ESTIMATES OF INCIDENTAL MORTALITIES IN AABM FISHERIES

1.2.1 SEAK Fisheries

Estimates of encounters and incidental mortality (IM) in SEAK fisheries are shown in Table 1.6. Estimates were converted from landed catch into treaty catch by multiplying the landed catch estimate of encounters by the ratio of treaty catch to landed catch for each respective fishery. The 2009 troll encounters were estimated from regressions of historical encounter estimates and troll effort. The regression predicts encounter estimates from troll effort using encounter estimates obtained from direct fishery observation programs conducted during a series of years. The retention and CNR sublegal regressions use a data series from 1998-2006, while the CNR legal regression uses a data series from 1985-1988 and 1998-2006. Sport fishery survey data from 2009 has not been tabulated, but 2008 sport fishery encounters were updated from the number of Chinook salmon caught and released as recorded on the annual Statewide Harvest Survey (mail-in survey) forms. Legal and sublegal CNR purse seine encounters were calculated using a modified catch per landing approach that uses the relationship between the yearly catch and the magnitudes of legal and sublegal CNR encounters for years where we have direct observational data. For the gillnet fishery, drop-off mortality was estimated as a percentage of the landed catch using the regional-specific drop-off rate for SEAK (CTC 2004c). Encounter estimates are multiplied by the respective IM rate found in CTC (1997) to obtain estimates of IM.

Table 1.6 Estimated treaty encounters and treaty incidental mortality in SEAK troll, net and sport fisheries for 2002-2009. Mortality estimates of fish released in troll and sport fisheries include drop-off mortality. In the net fishery, 21"-28" fish from both retention and non-retention periods are included in the CNR numbers.

Panel A - Troll and Sport Fisheries								
		Troll				**Sport**		
		Retention Fishery		**CNR Fishery**		**Retention**	**Releases**	
Year		**Legal Drop-off[1]**	**Sublegal**	**Legal**	**Sublegal**	**Legal Drop-off[1]**	**Legal**	**Sublegal**
2002	Encounters	NA	75,436	27,647	50,981	NA	23,570	35,801
2002	IM	2,385	19,840	6,055	13,408	1,638	3,748	5,692
2003	Encounters	NA	59,170	37,529	17,620	NA	19,061	41,093
2003	IM	2,459	15,562	8,219	4,634	1,773	3,031	6,534
2004	Encounters	NA	33,245	52,445	25,620	NA	29,675	44,009
2004	IM	2,575	8,744	11,486	6,738	1,995	4,718	6,997
2005	Encounters	NA	34,014	43,264	19,077	NA	20,496	56,386
2005	IM	2,440	8,946	9,475	5,017	2,281	3,259	8,965
2006	Encounters	NA	37,914	37,194	27,845	NA	20,706	51,578
2006	IM	2,112	9,971	8,146	7,323	2,514	3,292	8,201
2007	Encounters	NA	55,987	39,759	26,331	NA	15,592	52,778
2007	IM	1,928	14,724	8,707	6,925	2,227	2,479	8,392
2008	Encounters	NA	30,478	48,894	32,381	NA	18,558	28,898
2008	IM	1,012	8,016	10,708	8,516	1,176	2,951	4,595
2009	Encounters	NA	38,320	47,268	31,304	NA	NA	NA
2009	IM	1,272	10,078	10,352	8,233	1,731	NA	NA

Panel B - Net Fisheries and Total

		Net Fisheries				Total Incidental Mortality	
		Seine			Gillnet[2]		
		Retention	CNR Fishery		Legal		
Year		<21"	>28"	21"-28"	Drop-off[1]	Legal	Sublegal
2002	Encounters	1,212	206	542	NA		
2002	IM	1,040	105	399	147	14,078	40,378
2003	Encounters	9,437	599	1,577	NA		
2003	IM	8,097	305	1,159	118	15,905	35,985
2004	Encounters	3,996	9,176	1,018	NA		
2004	IM	3,429	4,680	748	221	25,675	26,656
2005	Encounters	5,519	0	0	NA		
2005	IM	4,736	0	0	125	17,580	27,664
2006	Encounters	6,127	0	0	NA		
2006	IM	5,257	0	0	190	16,255	30,752
2007	Encounters	6,572	7,509	19,776	NA		
2007	IM	5,639	3,830	14,535	181	19,352	50,215
2008	Encounters	101	83	219	NA		
2008	IM	87	42	161	195	16,084	21,374
2009	Encounters	4,092	0	0	NA		
2009	IM	3,511	0	0	176	13,531	21,823

[1] Drop-off mortality is computed as treaty catch times a percentage that incorporates a gear-specific encounter ratio and release mortality rate.

[2] Includes setnet

1.2.2 British Columbia Fisheries

1.2.2.1 NBC Fisheries

Table 1.7 summarizes encounter and IM estimates for the NBC AABM fisheries from 2002 to 2009 by size class during retention and Chinook salmon Non-retention (CNR) fishing periods. Encounters for the NBC troll fishery are based on phone-in hails. Encounters for the QCI sport fishery are based on creel survey and logbook programs. The table presents IM estimates using size specific rates from the CTC (1997). The estimated total mortality of Chinook salmon in the NBC AABM fisheries in 2009 was 119,280 nominal fish, including 109,470 fish in the landed catch and 9,810 fish from IM (Table 1.7).

Table 1.7 Estimated encounters and incidental mortalities (nominal fish) in NBC AABM troll and sport fisheries for 2002-2009. Mortality estimates of fish released in troll and sport fisheries include drop-off mortality.

		Troll				**Sport**		**Total Incidental Mortalities**	
		Retention Fishery		**CNR Fishery**		**Retention**	**Releases** [2]		
Year		**Legal & Sublegal Drop-off**	**Sublegal releases**	**Legal**	**Sublegal**	**Legal & Sublegal Drop-off**	**Legal**	**Legal**	**Sublegal**
2002	Encounters	NA [1]	2,608	5,109	129	NA [1]	42,226		
	IM	1,752	618	1,032	31	3,250	8,107	14,141	649
2003	Encounters	NA [1]	1,721	11,798	148	NA [1]	47,549		
	IM	2,335	408	2,383	35	3,747	9,129	17,594	443
2004	Encounters	NA [1]	2,605	31,460	489	NA [1]	116,741		
	IM	2,848	617	6,355	116	5,106	22,414	36,723	733
2005	Encounters	NA [1]	1,009	20,414	118	NA [1]	60,987		
	IM	2,972	239	4,124	28	4,747	11,710	23,552	267
2006	Encounters	NA [1]	9,947	818	54	NA [1]	32,480		
	IM	2,575	2,357	165	13	4,451	6,236	13,427	2,370
2007	Encounters	NA [1]	9,315	1,896	212	NA [1]	35,527		
	IM	1,415	2,208	383	50	4,209	6,821	12,828	2,258
2008	Encounters	NA [1]	4,277	1,707	140	NA [1]	10,649		
	IM	886	1,014	345	33	3,002	2,045	6,277	1,047
2009	Encounters	NA [1]	8,756	3,470	403	NA [1]	17,234		
	IM	1,283	2,075	701	95	2,346	3,309	7,639	2,171

[1] Drop-off mortality is computed from landed catch times a percentage that incorporates a gear-specific encounter ratio and release mortality rate.

[2] Releases are reported as 'mixed' sizes. However, since >90% of such releases are legal-sized, all reported releases were considered to be legal-sized for the purpose of estimating incidental mortality.

1.2.2.2 WCVI Fishery

The estimated total mortality of Chinook salmon in the WCVI AABM fisheries in 2009 was 139,686 nominal fish, including 124,617 Chinook salmon in the landed catch and 15,069 fish from IM (Table 1.8). The estimated IM included 8,729 legal and 6,340 sublegal fish in nominal numbers of fish. The estimates for the commercial troll fisheries in 2009 are based on landed catch multiplied by rates of encounter from previous years. Table 1.8summarizes encounter and IM estimates for these fisheries by size class during retention. In 2009, a non-retention AABM troll fishery opened in September to collect sublegal Chinook salmon DNA samples.

Table 1.8 Estimated encounters and incidental mortalities (nominal fish) in WCVI troll and sport AABM fisheries. Mortality estimates of fish released in troll and sport fisheries include drop-off mortality.

		Troll				Sport			Total Incidental Mortalities	
		Retention Fishery		CNR Fishery		Retention	Releases			
Year		Legal Drop-off	Sublegal	Legal	Sublegal	Legal Drop-off	Legal	Sublegal	Legal	Sublegal
2002	Encounters	NA[1]	20,645	0	0	NA[1]	12,326	7,507		
	IM	2,260	4,893	0	0	2,174	2,367	1,441	6,801	6,334
2003	Encounters	NA[1]	15,479	63	7	NA[1]	23,156	6,333		
	IM	2,581	3,793	13	0	1,851	4,446	1,216	8,891	5,009
2004	Encounters	NA[1]	10,430	0	0	NA[1]	16,601	5,485		
	IM	2,875	2,472	0	0	2,697	3,084	1,053	8,656	3,525[2]
2005	Encounters	NA[1]	10,328	0	0	NA[1]	19,323	4,571		
	IM	2,556	2,448	0	0	3,497	3,710	878	9,763	3,326
2006	Encounters	NA[1]	6,918	3,121	740	NA[1]	11,882	6,048		
	IM	1,854	1,640	626	175	2,519	2,281	1,161	7,280	2,976
2007	Encounters	NA[1]	8,626	0	0	NA[1]	5,973	15,590		
	IM	1,568	2,044	0	0	3,196	1,147	2,993	5,911	5,037
2008	Encounters	NA[1]	7,233	0	0	NA[1]	14,483	8,068		
	IM	1,546	1,714	0	0	3,488	2,781	1,549	7,815	3,263
2009	Encounters	NA[1]	3,918	211	259	NA[1]	16,520	27,863		
	IM	931	929	43	61	4,583	3,172	5,350	8,729	6,340

[1] Legal drop-off mortality is computed from landed catch, incorporating both an encounter ratio and a mortality rate.

[2] Sublegal dropoffs are included with sublegal incidental release mortalities

1.3 REVIEW OF ISBM FISHERIES

1.3.1 Canadian ISBM Fisheries

ISBM fisheries include all fisheries that harvest or release Chinook salmon in British Columbia under PST jurisdiction outside areas governed by AABM fisheries. In 2009, 204,378 Chinook salmon were harvested in Canadian ISBM fisheries in British Columbia and Canadian sections of the Alsek, Taku and Stikine Transboundary rivers. Total estimated IM in the Canadian ISBM fisheries in 2009 was 22,252 legal and 16,048 sublegal sized Chinook salmon. The distribution of the landed catches and estimated incidental mortalities in Canadian ISBM fisheries are presented in Table 1.9. Historical catches in Canadian fisheries are in Appendixes A2 through A8. Troll and Net catches from 1996-2004 have been updated with data from the Catch Finalization Project. The former Georgia Strait and Fraser River Appendix has been separated into two Appendix tables and the series of Fraser data has been updated from estimates collected from Area staff.

Table 1.9 Landed catch and incidental mortalities in Canadian ISBM fisheries for 2009.

Region	Fishery	Landed Catch	Release Legal	Release Sublegal	Total IM - Legal	Total IM - Sublegal	Total Nominal Mortality
Transboundary Rivers (Taku, Stikine, Alsek)	Gillnet	8,378	356	154	385	146	531
	Freshwater Sport	140	0	0	10	0	10
	First Nations	773	0	0	36	0	36
Regional Total		*9,291*	*356*	*154*	*431*	*146*	*576*
Northern BC	Gillnet	3,083	0	0	142	0	142
	Seine	0	2,003	0	1,442	0	1,442
	Tyee Test Fishery	1,189	0	0	55	0	55
	Tidal Sport	9,177	1,703	0	633	0	633
	Freshwater Sport	0	0	0	0	0	0
	First Nations	13,083	0	0	602	0	602
Regional Total		*26,532*	*3,706*	*0*	*2,874*	*0*	*2,874*
Central BC	Troll	0	0	0	0	0	0
	Gillnet	3,132	0	0	144	0	144
	Seine	0	0	0	0	0	0
	Tidal Sport	3,239	0	0	223	0	223
	Freshwater Sport	0	0	0	0	0	0
	First Nations	4,011	0	0	185	0	185
Regional Total		*10,382*	*0*	*0*	*552*	*0*	*552*
WCVI Terminal	Gillnet	7,167	0	0	330	0	330
	Seine	2,598	0	0	1,871	0	1,871
	Tidal Sport	31,921	6,504	10,137	3,451	1,946	5,398
	Freshwater Sport	0	0	0	0	0	0
	First Nations	9,026	0	0	415	0	415
Regional Total		*50,712*	*6,504*	*10,137*	*6,067*	*1,946*	*8,013*
Johnstone Strait	Troll	0	0	0	0	0	0
	Gillnet	26	14	0	14	0	14
	Seine	571	0	0	411	0	411
	Tidal Sport	10,776	1,432	14,552	1,018	2,794	3,812
	Freshwater Sport	0	0	0	0	0	0
	First Nations	344	0	0	16	0	16
Regional Total		*11,717*	*1,446*	*14,552*	*1,460*	*2,794*	*4,254*
Georgia Strait	Troll	0	135	0	0	0	0
	Gillnet	1	0	0	0	0	0
	Seine	238	0	0	171	0	171
	Tidal Sport	17,884	3,940	17,704	1,990	3,399	5,390
Regional Total		*18,123*	*4,075*	*17,704*	*2,162*	*3,399*	*0*
Juan de Fuca	Gillnet	0	0	0	0	0	0
	Seine	385	0	0	277	0	277
	Tidal Sport	25,587	3,736	40,433	2,483	7,763	10,246
	First Nations	0	0	0	0	0	0
Regional Total		25,972	3,736	40,433	2,760	7,763	10,523
Fraser River	Gillnet	6,893	124	0	434	0	434
	Freshwater Sport	17,468	15,845	0	4,248	0	4,248
	First Nations	27,288	105	0	1,265	0	1,265
Regional Total		*51,649*	*16,074*	*0*	*5,947*	*0*	*5,947*
Grand Total		**204,378**	**35,897**	**82,980**	**22,252**	**16,048**	**38,300**

1.3.2 Southern U.S. Fisheries Harvest

Southern U.S. fisheries of interest to the PSC, generally those north of Cape Falcon, Oregon, are managed in accordance with legal obligations stemming from treaties between Indian tribes and the United States. In 1974, *U.S. v Washington* set forth sharing obligations to meet Treaty fishing rights in western Washington. Treaty rights of Columbia River tribes were defined by *U.S. v Oregon*, and the Columbia River Fisheries Management Plan was implemented in 1977. In reporting these fisheries, fishermen are termed "treaty" if they are fishing under the Native Treaty fishing rights and "non treaty" otherwise. As specified in the 2008 agreement, all southern U.S. fisheries are ISBM fisheries. Historical catches in these fisheries may be found in Appendices A.8 through A.14.

1.3.2.1 Strait of Juan de Fuca and the San Juan Islands

The preliminary estimate of the 2009 Chinook salmon catch in Strait of Juan de Fuca tribal net fisheries directed at Sockeye salmon is 94. An additional 5 Chinook salmon were taken during the Coho management period. There were no 2009 San Juan Islands net fisheries directed at Sockeye salmon. The preliminary estimate of the 2009 Strait of Juan de Fuca treaty troll fishery is 3,280 Chinook salmon through December. The catch estimate does include catches from Area 4B during the May-September PFMC management period. Historic catch estimates are provided in Appendices A.8 and A.9 for the Strait of Juan de Fuca and San Juan areas respectively.

1.3.2.2 Puget Sound

The preliminary estimate of the 2009 tribal and non-tribal net fishery harvests in Puget Sound marine areas is 41,246 (38,509 tribal, 2,737 non-tribal) for all marine areas excluding 4B, 5, and 6, 6A, 6B, and 6C in the Strait of Juan de Fuca. Additional tribal net harvest occurred in freshwater fisheries with a preliminary estimate of 27,904. Estimates of the sport catch in 2009 are not yet available. Historic catch tables for Puget Sound exclusive of the San Juans are provided in Appendix A.10.

1.3.2.3 Washington Coast

Tribal commercial and ceremonial and subsistence fisheries harvested a total of 9,619 Chinook salmon in north coastal rivers (Quinault, Queets, Hoh, and Quillayute) in 2009. An additional 48 Chinook salmon were harvested by the Makah tribal fisheries in the Waatch and Sooes rivers.

Harvest in Grays Harbor includes catch from both the Humptulips and Chehalis rivers. The 2009 tribal net fisheries harvested an estimated 2,207 Chinook salmon. The 2009 non-Indian commercial net harvest in Grays Harbor was 1,195 Chinook salmon. Approximately 6,929 Chinook salmon were harvested by non-Indian commercial net fisheries in Willapa Bay in 2009.

From Grays Harbor north, recreational fisheries were implemented based upon pre-season tribal-state agreements and were subject to in-season adjustment. Estimates of sport fishery catches for Washington coastal terminal fishing areas in 2009 are not available. Historic catch estimates for Washington Coastal inside fisheries are shown in Appendix A.11.

Ocean fisheries off the coasts of Washington and Oregon are managed under regulations recommended by the Pacific Fishery Management Council. The estimated catch of Chinook salmon in commercial troll fisheries from Cape Falcon to the U.S.-Canada border in 2009 was 35,100 for both treaty and non-treaty fisheries combined. Estimated catch in the ocean recreational fishery north of Cape Falcon in 2009 was 15,457 Chinook salmon. Historic catch estimates for U.S. ocean fisheries north of Cape Falcon are shown in Appendix A.12

1.3.2.4 Columbia River

Chinook salmon from the Columbia River are divided into eight stock groups for management purposes. These groups are delineated by run timing and area of origin: (1) spring run originating below Bonneville Dam; (2) spring run originating above Bonneville Dam; (3) summer run originating above Bonneville Dam; (4) fall run returning to Spring Creek Hatchery; (5) fall run originating in hatchery complexes below Bonneville Dam; (6) wild fall run originating below Bonneville Dam; (7) upriver bright fall run; and (8) mid-Columbia bright fall hatchery fish.

In 2009, the total annual harvest for all fisheries (spring, summer and fall) in the Columbia River basin was 283,419 Chinook salmon, which included non-Indian commercial net harvest of 71,372, sport harvest of 78,311 and treaty Indian commercial, ceremonial and subsistence harvest of 133,736 Chinook salmon.

1.3.2.5 Ocean Fisheries, Cape Falcon to Humbug Mountain

Most harvest in ocean fisheries off Oregon's coast is comprised of a mixture of southern Chinook salmon stocks not included in the PSC agreement. These stocks do not migrate north into the PSC jurisdiction to any great extent. Some stocks originating from Oregon coastal streams do migrate into PSC fisheries, including the North Oregon Coastal (NOC) and Mid-Oregon Coastal (MOC) stock aggregates. The NOC stocks are harvested only incidentally in Oregon ocean fisheries, while the contribution of MOC stocks to Oregon ocean fisheries is believed to be much greater. Catch statistics are readily available only for a terminal area troll fishery on one MOC stock at the mouth of the Elk River. Late season (October-December) troll catch in the Elk River terminal troll fishery in 2009 was 293 Chinook salmon.

Recreational catch of these two stock groups occurs primarily in estuary and freshwater areas as mature fish return to spawn and is reported through a "punch card" accounting system. These data are only available more than two years after the current season. Therefore, we can only report the riverine and estuarine sport catch though 2008 for the NOC and MOC groups. The 2008 punch card estimate of estuary and freshwater catch for the NOC and MOC groups is 17,547 Chinook salmon. Historic catch estimates for the Elk River troll fishery and the estuary and freshwater sport fisheries targeting on MOC and NOC stocks are shown in Appendix A.14.

1.4 ESTIMATES OF INCIDENTAL MORTALITY FOR SOUTHERN U.S. FISHERIES

Table 1.10 shows estimates of incidental mortalities for Washington Coastal and Puget Sound fisheries. Sources of estimates are shown in the table footnotes. No estimates of incidental mortalities were provided for 2009 for ocean fisheries south of Cape Falcon or Columbia River fisheries.

Table 1.10 Estimated incidental mortality in Southern US troll, net, and sport fisheries for 2009.

Fishery	**Troll**	**Net**[1]	**Sport**
Strait of Juan de Fuca	280 [2,3]	51	3,726
San Juan Islands	0	3,135	3,176
Puget Sound	0	804	34,906
Washington Coast	0	562	200
North of Cape Falcon	15,911 [3]	0	2,338 [3]

[1] Assume 3% net dropout rate

[2] Estimates from FRAM

[3] Estimates from direct observations

2 CHINOOK SALMON ESCAPEMENTS

2.1 INTRODUCTION

The Agreement (Pacific Salmon Treaty Fishing Annexes & Related Agreements, June 30, 1999) established a Chinook salmon management program that:

"introduces harvest regimes that are based on estimates of Chinook salmon abundance, that are responsive to changes in Chinook salmon production, that take into account all fishery induced mortalities and that are designed to meet MSY or other agreed biologically-based escapement objectives"

This chapter compares annual escapement estimates with maximum sustained yield (MSY) or other accepted biologically-based escapement goals established for Chinook salmon stocks. The CTC has reviewed and accepted escapement goals for 24 stocks included in this report. For these stocks, the CTC can evaluate stock status in relation to the accepted goals. For stocks without accepted goals, the CTC must rely on the time series of escapement data and the agency commentary for the individual stocks to provide a perspective on stock status and escapement trends.

Annual reports prior to 2006 included a section on the framework used for escapement assessments and narratives for each stock that included a description of escapement methodology, escapement goal basis, and agency comments. For these more detailed stock narratives and descriptions of escapement methods, please refer to the 2004 Catch and Escapement Report (CTC 2005a).

2.1.1 MSY or Biologically-Based Escapement Goals

2.1.1.1 Origin of Goals

Escapement goals accepted by the CTC were based on analyses that followed the guidelines developed in the CTC escapement goal report (CTC 1999). In the stock-specific narratives presented with the escapement graphs, the agencies may refer to agency goals, but only CTC-accepted escapement goals and ranges (in gray shading) are shown on the escapement graphs and used for evaluation. Table 2.1 presents the status of escapement goal reviews by the CTC for stocks identified as escapement indicator stocks.

Table 2.1. PSC Chinook salmon escapement indicator stocks, where shading indicates that there is not a CTC accepted escapement goal for PSC assessment of stock status.

Presence in Treaty Attachments					Stock Group In Att. I-V	Escapement Indicator	Region	Run
SEAK	NBC/ QCI	WCVI	BC ISBM	SUS ISBM				
✓						Situk	Yakutat	Spring
✓						Alsek	Yakutat	Spring
✓						Taku	TBR	Spring
✓						Stikine	TBR	Spring
✓						Chilkat	N Inside	Spring
✓						King Salmon	N Inside	Spring
✓						Andrew Creek	C Inside	Spring
✓						Unuk	S Inside	Spring
✓						Chickamin	S Inside	Spring
✓						Blossom	S Inside	Spring
✓						Keta	S Inside	Spring
✓	✓		✓		Northern/Central B.C.	Yakoun	NBC-Area 1	Summer
✓	✓		✓		Northern/Central B.C	Nass	NBC-Area 3	Spring/Summer
✓	✓		✓		Northern/Central B.C	Skeena	NBC-Area 4	Spring/Summer
			✓		Northern/Central B C.	Dean	CBC-Area 8	Spring
						Rivers Inlet	CBC-Area 9	Spring/Summer
✓	✓		✓		WCVI Falls	Artlish, Burman, Kaouk, Tahsis, Tashish, Marble	WCVI	Fall
✓	✓		✓		Upper Strait of Georgia	Klinaklini , Kakwiekan, Wakeman, Kingcome, Nimpkish	UGS	Sum/Fall
			✓		Lower Strait of Georgia	Cowichan/Nanaimo[2]	LGS	Fall
✓	✓		✓		Fraser Early[1] (Spr/Sum)	Fraser Spring 1 3	Fraser River	Spring
✓	✓		✓		Fraser Early[1] (Spr/Sum)	Fraser Spring 1.2	Fraser River	Spring
✓	✓		✓		Fraser Early[1] (Spr/Sum)	Fraser Summer 1 3	Fraser River	Summer
✓	✓		✓		Fraser Early[1] (Spr/Sum)	Fraser Summer 0.3	Fraser River	Summer
		✓	✓	✓	Fraser Late	Harrison	Fraser River	Fall
			✓	✓	N. P.S. Natural Springs	Nooksack	NC/PS	Spring
			✓	✓	N P.S Natural Springs	Skagit Spring	NC/PS	Spring
		✓	✓	✓	P.S. Natural Summer/Falls	Skagit Summer/Fall	NC/PS	Summer/Fall
		✓	✓	✓	P S Natural Summer/Falls	Stillaguamish	NC/PS	Summer/Fall
		✓	✓	✓	P S Natural Summer/Falls	Snohomish	NC/PS	Summer/Fall
		✓	✓	✓	P S Natural Summer/Falls	Lake Washington	NC/PS	Summer/Fall
		✓	✓	✓	P S Natural Summer/Falls	Green	NC/PS	Summer/Fall

-continued-

Table 2.1. Continued.

Presence in Treaty Attachments					Stock Group In Att. I-V	Escapement Indicator	Region	Run
SEAK	NBC/ QCI	WCVI	BC ISBM	SUS ISBM				
✓	✓			✓	WA Coastal Fall Natural	Hoko	WAC/JDF	Fall
						Quillayute Summer	WAC/JDF	Summer
✓	✓			✓	WA Coastal Fall Natural	Quillayute Fall	WAC/JDF	Fall
						Hoh Spring/Summer	WAC/JDF	Summer
✓	✓			✓	WA Coastal Fall Natural	Hoh Fall	WAC/JDF	Fall
						Queets Spring/Summer	WAC/JDF	Summer
✓	✓			✓	WA Coastal Fall Natural	Queets Fall	WAC/JDF	Fall
						Grays Harbor Spring	WAC/JDF	Spring
✓	✓			✓	WA Coastal Fall Natural	Grays Harbor Fall	WAC/JDF	Fall
						Col. Upriver Spring	CR	Spring
✓	✓	✓		✓	Col. Upriver Summers	Mid-Columbia Summers	CR	Summer
✓	✓	✓		✓	Columbia River Falls	Col. Upriver Bright	CR	Fall
✓	✓	✓		✓	Columbia River Falls	Lewis	CR	Fall
✓	✓	✓		✓	Columbia River Falls	Deschutes	CR	Fall
✓	✓			✓	Far N. Migrating OR Coast	Nehalem	NOC	Fall
✓	✓			✓	Far N. Migrating OR Coast	Siletz	NOC	Fall
✓	✓			✓	Far N. Migrating OR Coast	Siuslaw	NOC	Fall
						South Umpqua	MOC	Fall
						Coquille	MOC	Fall

[1] The escapement indicator stocks listed in the Annex tables for this group are Upper Fraser, Middle Fraser, and Thompson. The Fraser spring/summer group is split into these 4 escapement indicators to represent the stock group by life history type rather than geographically.

[2] An escapement goal was established for the Cowichan in 2005, a goal for Nanaimo is still pending.

2.2 ESCAPEMENT GOAL ASSESSMENTS

The Agreement directs the CTC to "report annually on the escapement of naturally spawning Chinook salmon stocks in relation to the agreed escapement objectives referred to below, evaluate trends in the status of stocks, and report on progress in rebuilding of naturally spawning Chinook salmon stocks" (Annex IV, Chapter 3, Paragraph 1.b.iii). In this report, escapement assessments include stock specific graphs of escapements and commentary, presented to provide a perspective on stock status and escapement trends through 2009. More detailed commentary for each stock can be found in previous CTC catch and escapement reports, e.g. CTC (2005a).

The escapement goals and 2009 escapements for the 25 stocks with CTC accepted escapement goals are listed in Table 2.2. For 12 of these stocks, the agency escapement goal is defined as a range; for the remaining 13 stocks, the escapement goal is defined as a point estimate. In 2009, escapements were within the goal range for 3 stocks, above the range or S_{MSY} point estimate for 8 stocks, and below the goal for 14 stocks.

The CTC has now assessed the status of stocks with CTC-accepted goals for return years 1999-2009. Over this time period, the number of stocks with CTC-accepted goals has increased from 16 to 25 (Figure 2.1). From 1999-2008, the percentage of stocks below escapement goals or goal ranges has varied from 4% to 54%. In 2009, 52% of stocks were below goals or goal ranges.

Table 2.2. Escapement goals and 2009 escapements for PSC Chinook salmon escapement indicator stocks with biologically-based goals accepted by the CTC.

Stock	**Region**	**Stock Group**	**Escapement Goal**	**2008 Escapement**	**2009 Escapement**	**2010 Forecast**
Situk	SEAK	Yakutat	500-1,000	413	902	NA
Alsek	SEAK/TBR	Yakutat	3,500-5,300	1,939	6,401	NA
Chilkat	SEAK	Northern Inside	1,750-3,500	3,233	4,429	NA
Taku	SEAK/TBR	TBR	19,000-36,000	27,383	20,762	NA
Stikine	SEAK/TBR	TBR	14,000-28,000	21,900	12,596	NA
King Salmon	SEAK	Northern Inside	120-240	120	109	NA
Andrew Creek	SEAK	Central Inside	650-1,500	981	628	NA
Unuk (survey index)	SEAK	Southern Inside	1,800-3,800	3,104	3,157	NA
Chickamin (survey index)	SEAK	Southern Inside	450-900	1,111	611	NA
Blossom (survey index)	SEAK	Southern Inside	250-500	257	123	NA
Keta (survey index)	SEAK	Southern Inside	250-500	363	219	NA
Harrison	BC	Fraser River	75,100-98,500	41,603	70,141	78,032
Cowichan	BC	LGS	6,500	1,109	540	NA
Mid Col. Upr. Summer	CR	Columbia River	17,857	20,786	17,787	88,800
Col. Upriver Brights	CR	Columbia River	40,000	76,599	50,215	310,800
Deschutes River Fall	CR	Columbia River	4,532	6,908	9,890	NA
Lewis	CR	Columbia River	5,700	5,200	5,410	7,300
Quillayute Fall	WAC	WA Coast	3,000	4,306	3,083	NA
Queets Spring/Summer	WAC	WA Coast	700	305	495	NA
Queets Fall	WAC	WA Coast	2,500	3,082	2,909	NA
Hoh Spring/Summer	WAC	WA Coast	900	550	880	NA
Hoh Fall	WAC	WA Coast	1,200	1,774	2,081	NA
Nehalem	ORC	NOC	6,989	3,810	5,332	4,708
Siletz	ORC	NOC	2,944	1,202	2,905	4,189
Siuslaw	ORC	NOC	12,925	11,119	14,094	21,848

The CTC has now assessed the status of stocks with CTC-accepted goals for return years 1999-2009. Over this time period, the number of stocks with CTC-accepted goals has increased from 16 to 25 (Figure 2.1). From 1999-2008, the percentage of stocks below escapement goals or goal ranges has varied from 4% to 54%. In 2009, the percentage of stocks below goals or goal ranges was 52%. Of the 13 stocks below goal, 9 stocks (69%) were within 15% of the target goal; the stocks at more than 15% below goal were the Blossom, Cowichan, Queets spring/Summer, and the Nehalem stocks.

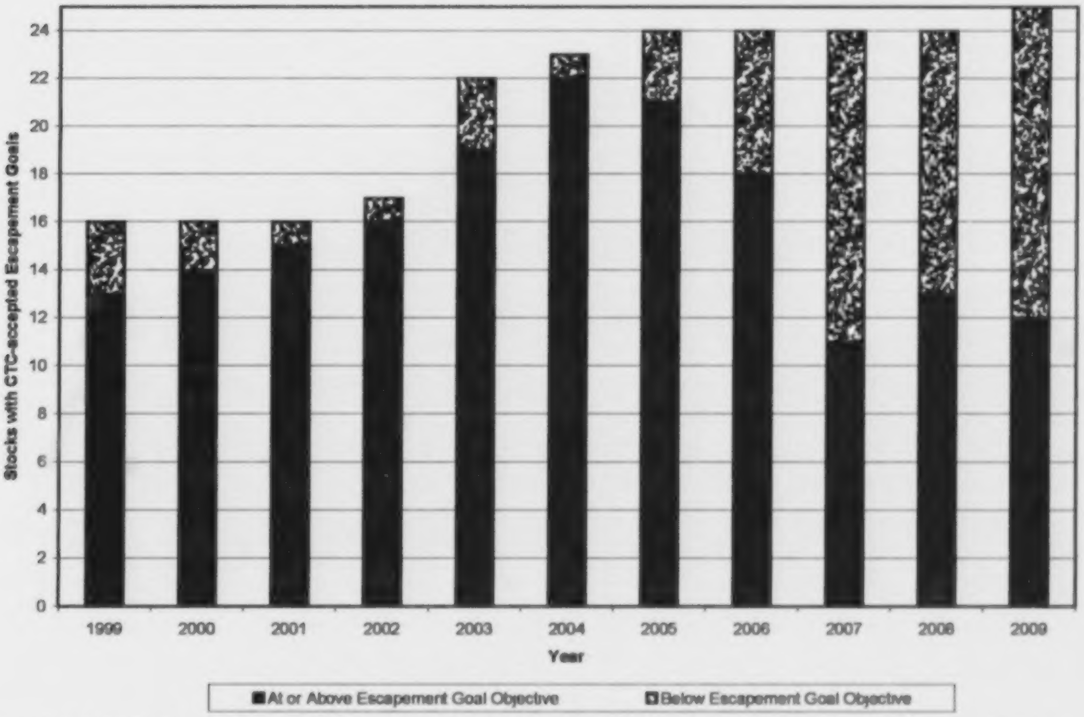


Figure 2.1. Number and status of stocks with CTC-accepted escapement goals for years 1999-2009.

2.3 PARAGRAPH 13 ESCAPEMENT ANALYSIS

Paragraph 13 of the 2008 Agreement describes a process to implement additional management actions in AABM and ISBM fisheries if the management as prescribed in paragraphs 8 and 10 fail to meet MSY or other biologically-based escapement objectives. Paragraph 13 details a process for evaluating stock groups and indicator stocks listed in Attachments I-II to determine if additional management actions should be implemented in AABM fisheries. If additional management action is required, relevant ISBM fisheries for stocks also listed in Attachments IV and V would commensurately be reduced to increase the escapements of the depressed Chinook salmon stocks within the stock groups triggering the additional management actions. The CTC is to notify the Commission of any proposed fishery restrictions to be implemented under Paragraph 13 at the February Annual Meeting.

Additional management actions for SEAK or NBC AABM fisheries would reduce Table 1 catch limits by 10% if a majority of stocks with agreed management objectives in at least two of the stock groups listed in Attachment I and II of the Chinook Annex were observed:

- to be at least 15% below their escapement goal management objectives for the past year and are forecast to be at least 15% below their escapement goal objectives in the upcoming year; or

- were observed to be at least 15% below their escapement goal objectives for the past two consecutive years (unless a forecast for escapement will exceed the escapement objective in the coming year).

If three or more stock groups in Attachments I and II meet the criteria to trigger additional management action, Table 1 catch limits in the relevant AABM fishery would be reduced by 20%.

For the WCVI AABM fishery, Attachment III of the 2008 Agreement lists stock groups applicable to the obligations defined in paragraph 13. However, in consideration of the 30% reduction in catch limits for the WCVI AABM fishery, the 2008 Agreement states that additional actions will not be taken for this fishery except as otherwise may be agreed by the Commission.

The CTC is assigned by the 2008 Agreement to provide a review of Attachments I-V by 2014 or earlier, to determine if the current lists of stock groups continue to be appropriate, if there are new criteria that could be employed to revise stock group listings for each attachment, and whether any changes to the Attachments proposed by a Party may be appropriate. In the interim, the CTC in this report provides an evaluation of the stocks listed in Attachments I-III in relation to the criteria described in Paragraph 13.

In Table 2.3, the CTC summarizes the performance of the stock groups and the criteria for initiating additional management action in regards to Paragraph 13, based upon observed escapements and exploitation rates through 2009 and stock forecasts for 2010. For SEAK and NBC AABM fisheries, the stock groups in Attachment I and II are identical, and thus are combined in Table 2.3. All stocks relevant to Paragraph 13 decisions for SEAK and NBC AABM fisheries have escapement based management objectives. Although not meeting management objectives does not automatically trigger reductions in the WCVI AABM fishery, the CTC included an evaluation of the stock groups in Attachment III to inform the Commission of the performance of the stock groups in Attachment III in relation to the provisions of Paragraph 13. For the WCVI AABM fishery, stocks in the Puget Sound Summer/Fall stock group include three stocks with exploitation rate management objectives.

No stock groups listed in Attachment I-III met the criteria for triggering additional management action under Paragraph 13 for either the 2008 and 2009 observed values or the 2009 and 2010 forecast values (Table 2.3). However, the CTC could not evaluate if any of the stocks met the conditions in Paragraph 13(d), because harvest levels for ISBM fisheries were not yet available for 2009. Only one stock with an agreed escapement objective, the Nehalem in the NOC stock group, was more than 15% below the management objective in both 2008 and 2009. The Nehalem was also the only stock with an agreed escapement objective and a forecast below its threshold in 2010. The other two NOC stocks are forecast to be above goal in 2010.

Only 5 of the 10 different stock groups in Table 2.3 have stocks with agreed management objectives that can be evaluated for triggering additional management action. Of the 11 stocks with agreed escapement objectives, forecasts for 2010 were available for only 7 (Table 2.3). There is clearly a need to develop management objectives and forecast capabilities for more of the stocks included in Attachments I-III to improve the efficacy of the Paragraph 13.

This analysis was done well after the February timing required by the 2008 Agreement for the CTC to notify the Commission of any proposed fishery restrictions to be implemented under Paragraph 13 for the 2010 fishing season. Also, the CTC has not yet set the standards for precision and accuracy for forecasts and predictions used to develop Table 2.3. These data standards will be required before the evaluations that rely on forecasts can be used to recommend additional management action. However, the CTC has carried out the evaluation of the Paragraph 13 criteria, with the exception 13(d) and (e), to provide insight into current status of stocks in relation to the criteria and to identify data needs for the application of Paragraph 13. To meet the timing requirement for implementation of Paragraph 13, the CTC will need by the February Annual Meeting a) escapement and exploitation rate estimates for the prior year for stocks included in Paragraph 13 Attachments I-V; and b) projections of exploitation rates and forecasts of escapements for the coming year for these same stocks.

The Commission has assigned the CTC to review Attachments I-V and to provide recommendations to the Commission. In its review, the CTC may consider the schedule of needed information for evaluation of the stock group criteria to determine how early in the annual cycle recommendations for additional management actions under Paragraph 13 can be provided to the Commission.

Table 2.3 Evaluation of criteria for initiating additional management action in regards to Paragraph 13 of the Chinook Chapter of the 2008 Agreement. NA indicates the stock group cannot be evaluated because an insufficient number of stocks in the group have agreed escapement objectives, or that forecasts were not provided to the CTC for stocks with agreed escapement objectives.

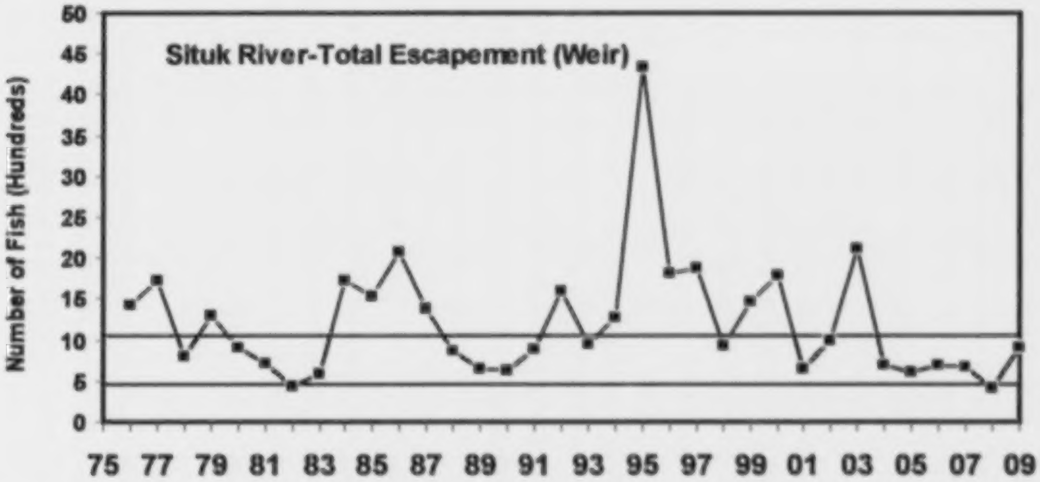
Fishery	**Stock Group**	**Number of stocks**	**Number of stocks with agreed objective**	**Number below threshold (2008 and 2009)**	**Stocks with a 2010 forecast**	**Number of 2010 forecasts below threshold**	**Paragraph 13 criteria met**
SEAK & NBC	North/Central British Columbia	3	0	NA	0	NA	**No**
	Upper Strait of Georgia	5	0	NA	0	NA	**No**
	West Coast Vancouver Island Falls	7	0	NA	0	NA	**No**
	Far North Migrating Northern Oregon Coast Falls	3	3	1	3	1	**No**
	Columbia River Falls	3	3	0	2	0	**No**
	Columbia River Summers	1	1	0	1	0	**No**
	Washington Coastal Fall Naturals	5	3	0	3	0	**No**
	Fraser Early (Spring & Summers)	3	0	NA	0	NA	**No**
WCVI	Columbia River Falls	3	3	0	2	0	**No**
	Fraser Late	1	1	0	1	0	**No**
	Puget Sound Natural Summer/Fall	5	0	NA	5	NA	**No**
	Columbia River Summers	1	1	0	1	0	**No**

2.4 STOCK SPECIFIC GRAPHS AND COMMENTARIES

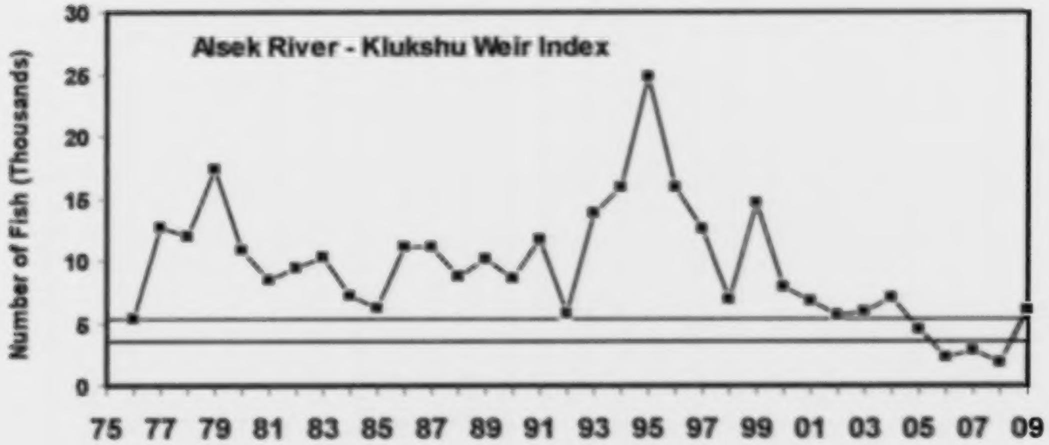
Graphs of time series of escapements and terminal runs for Chinook salmon stocks are included in sections for Alaska, Canada, and Washington/Columbia River/Oregon. A limited commentary is also provided for each stock; more details on historical assessments and escapement goals for individual stocks are available in CTC (2005a). Each graph contains the name of the stock and the type of data depicted (total escapement, index counts, terminal runs, etc.). For the graphs that include estimates of the terminal run size, the harvests in terminal runs, in some cases, include both jacks and adults, whereas the escapement is usually reported in adults. The *x*-axis represents calendar years. All escapement goals accepted by the CTC are shown except for the LGS stock group because this group includes both the Cowichan and Nanaimo stocks and only the Cowichan has a CTC accepted goal. Historical escapement and terminal run data are provided for SEAK stocks in Appendix B.1, for Canadian stocks in Appendix B.2, for Puget Sound in Appendix B.3, Washington Coastal stocks in Appendix B.4, for Columbia River stocks in Appendix B.5 and Oregon Coastal stocks in Appendix B.6.

2.4.1 SEAK/TBR Stocks

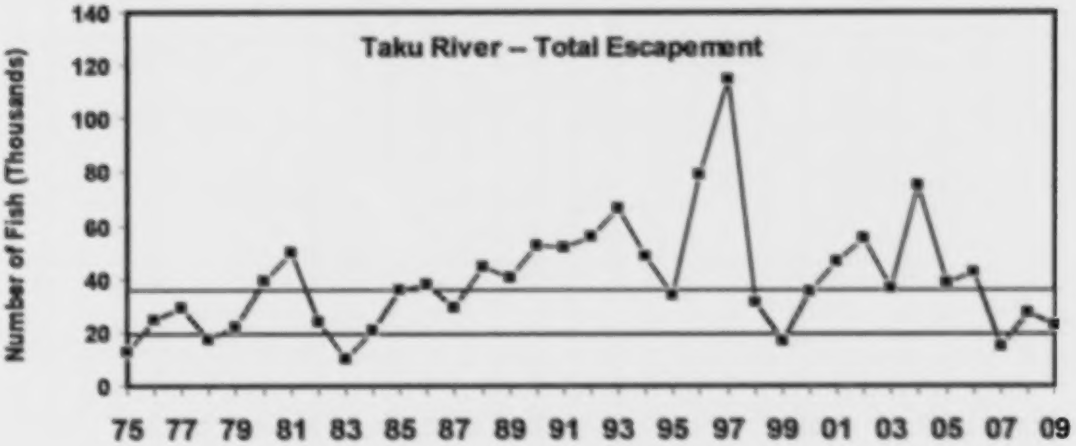
Of the 11 SEAK/TBR stocks included in the escapement assessment, the Situk, Alsek, Chilkat, Taku, King Salmon, Stikine, and Unuk rivers and Andrew Creek include estimates of total escapement of large fish, Chinook salmon > 659 mm mid-eye to fork (MEF) length. Escapement estimates for the Chickamin, Blossom, and Keta rivers are index counts of large fish. These indices are enumerated from foot/aerial helicopter surveys that represent a fraction (one-third to one-fifth) of the total escapement. Except for the Chilkat River, survey methods have been standardized for all systems since 1975. The assessment of Chilkat River Chinook salmon was standardized in 1991 as an annual mark-recapture estimate of escapement. Escapement goals have been defined as a range for the SEAK/TBR stocks, shown by the grey shaded area on the graphs.



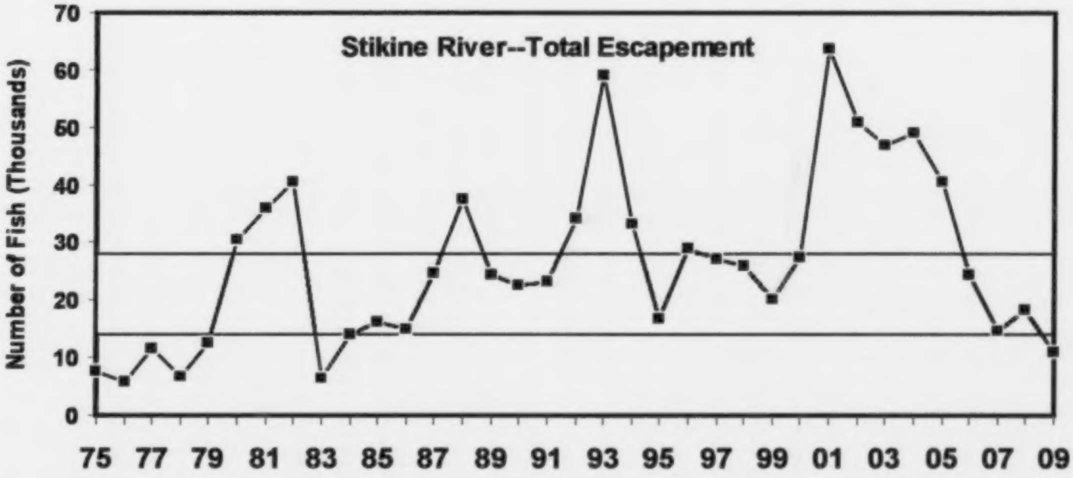
The Situk River is a small non-glacial system that supports a moderate run of outside-rearing Chinook salmon. Escapements are based on weir counts minus upstream sport fishery harvests (if any) estimated from an on-site creel survey and a postseason mail-out survey. The weir has been operated annually since 1976, and was also operated from 1928-1955.



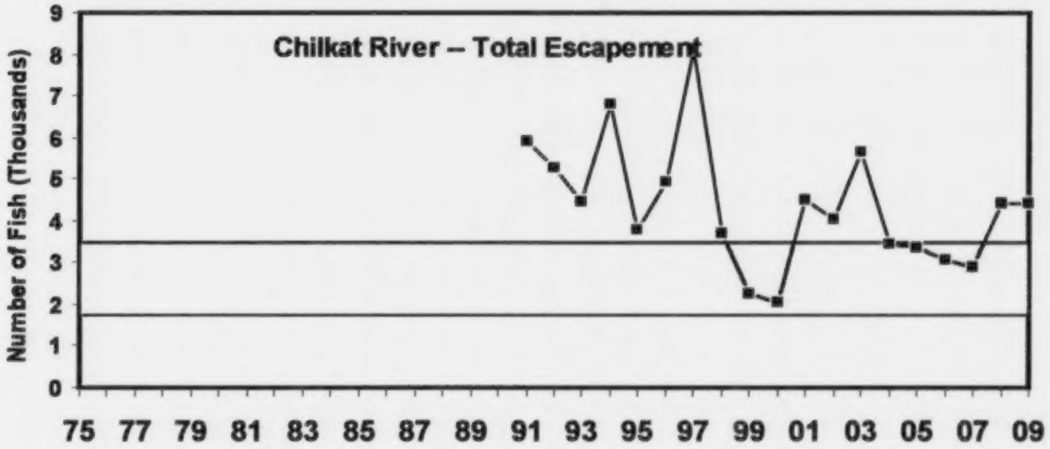
Commentary: The Alsek River is large Transboundary glacial system that supports a moderate run of outside-rearing Chinook salmon. In previous reports, index escapements using a weir operated at the Klukshu River were presented for this stock. These have been replaced with estimates of total escapement drainage wide, including direct mark-recapture estimates for 1998-2004. All other years are Klukshu River weir counts expanded by the average expansion factor from 1998-2004. A revised goal of 3,500 to 5,300 total spawners was accepted by the CTC during this cycle, based on analysis in Bernard and Jones (2010).



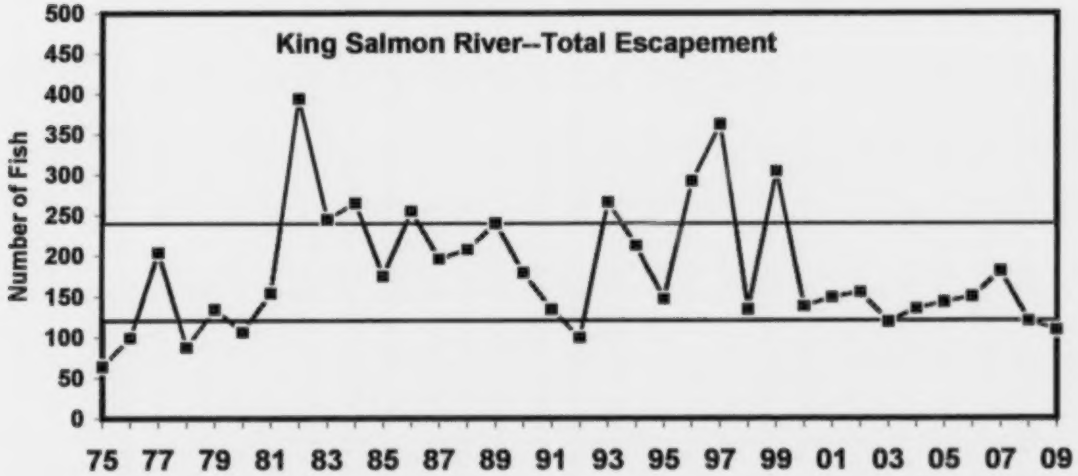
Commentary The Taku River is a large Transboundary glacial system that supports a large run of outside-rearing Chinook salmon. In 1989, 1990, and 1995-2009 escapements were estimated using mark-recapture methods. In other years since 1975, aerial counts were expanded by a factor of 5.2, the 5-year average of the ratio of the mark-recapture estimates to aerial survey counts (McPherson et al. 2000). A revised goal of 19,000 to 36,000 large Chinook salmon (age-.3 to -.5 fish) was accepted by the CTC and TBR Panel during this cycle, based on the analysis in McPherson et al. (2010).



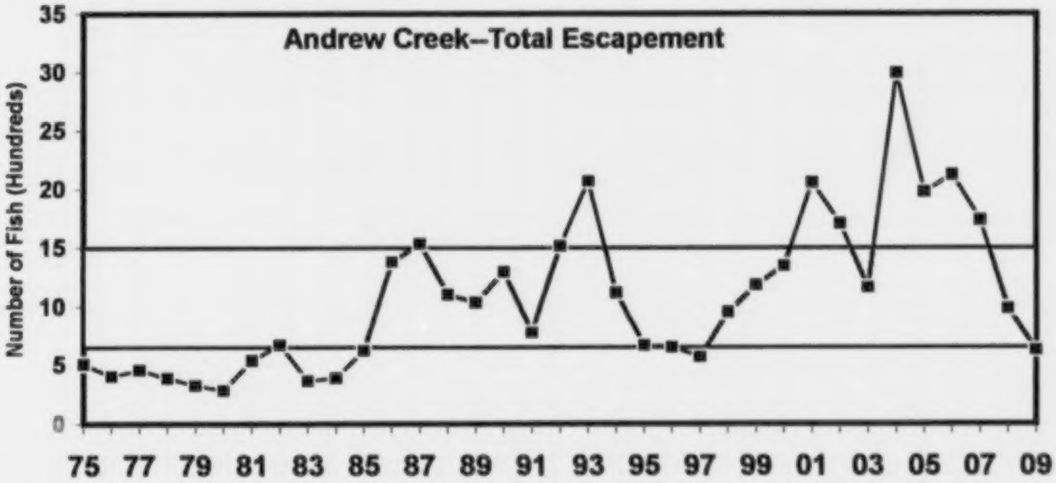
Commentary The Stikine River is a large Transboundary glacial system that supports a large run of outside-rearing Chinook salmon. From 1975 through 1984 index escapements were made using survey counts and since 1985 counts were made using a weir at the Little Tahltan River. Since 1996 mark-recapture experiments were conducted annually to estimate total escapement. These studies indicate the weir counts represented 17% to 20% of the total escapement (Pahlke and Etherton 1999). In 2009, the estimated escapement was 90% of the lower end of the escapement goal range due to poor survival conditions. No directed fisheries were operated on this stock in 2009 because preseason and inseason forecasts correctly identified a very low run size.



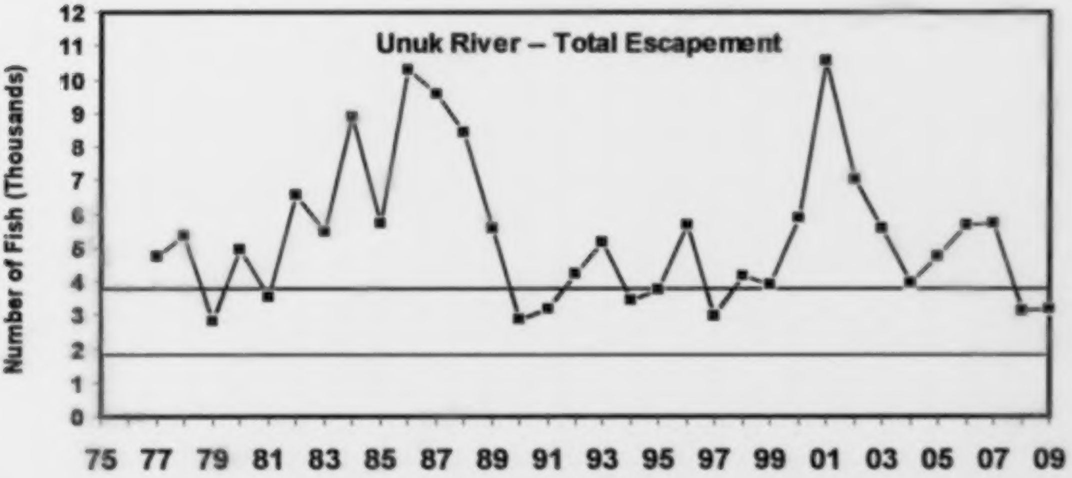
Commentary The Chilkat River is a moderate-sized glacial system moderate run of inside-rearing Chinook salmon. Since 1991, escapements have been estimated annually using mark-recapture methods (Ericksen and McPherson 2003). The current biological escapement goal of 1,750 to 3,500 was formally accepted by the CTC in 2005.



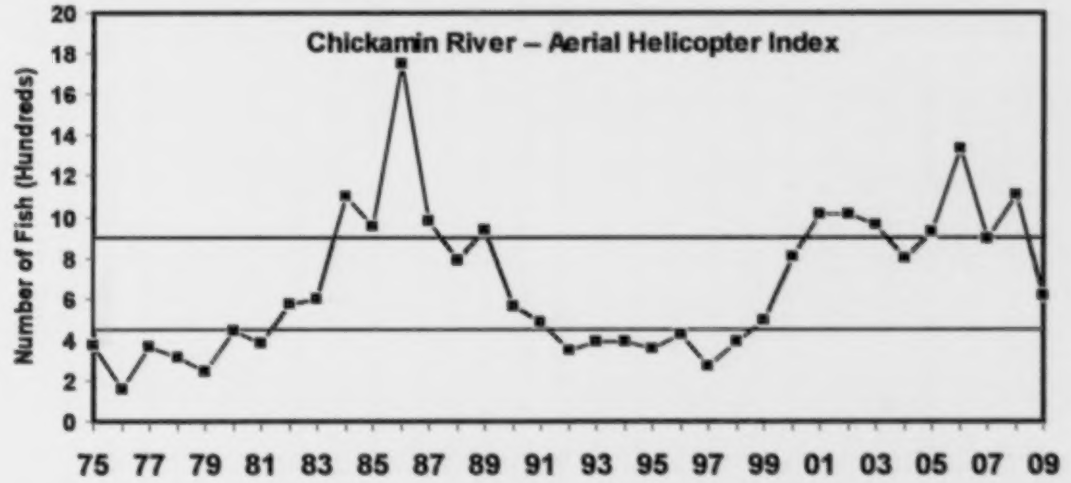
Commentary: The King Salmon River is a small non-glacial system that supports a small run of inside-rearing Chinook salmon. Escapements are based upon weir counts from 1983 to 1992 and expansions of index counts from 1971 to 1982 and 1993 to 2006. The 10 years of weir data showed that on average the escapement was 1.52 times the index count (McPherson and Clark 2001). In 2009, the estimated escapement was 91% of the lower end of the escapement goal range due to poor survival conditions.



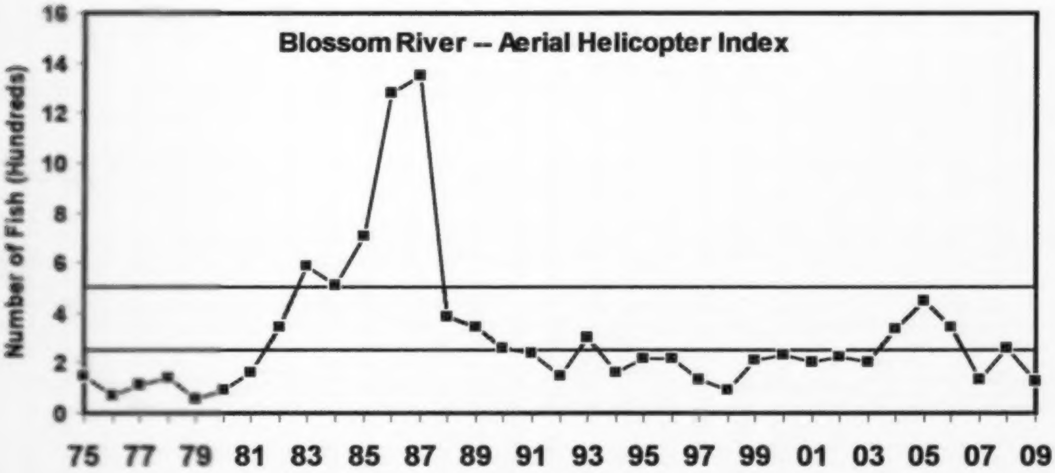
Commentary Andrew Creek, a tributary of the lower Stikine River, is a small non-glacial system that supports a moderate run of inside-rearing Chinook salmon. Escapements are based upon weir counts from 1976 to 1984 and expansions of index counts in 1975 and 1985 to 2006. Four years of concurrent weir and index count data were used to estimate the expansion factor of 1.95. In 2009, the estimated escapement was 97% of the lower end of the escapement goal range due to poor survival conditions.



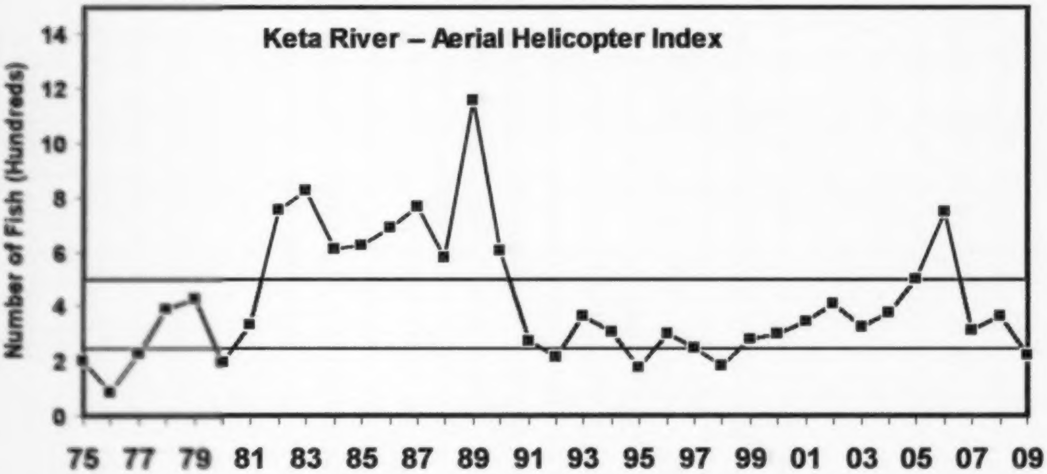
Commentary: The Unuk River is a moderate-sized glacial system that supports a moderate run of inside-rearing Chinook salmon. Indices of escapement since 1977 are based on the sum of peak index counts from six main tributaries (Pahlke 2003). Mark-recapture studies were implemented in 1994 and annually since 1997 (Weller and McPherson 2003). The current estimated expansion factor is 4.87 for index counts from 1977-1996. The CTC accepted an escapement goal range of 1,800 to 3,800 total large spawners for this stock during this cycle, based on the analysis in Hendrich et al. (2008).



Commentary: The Chickamin River is a moderate-sized glacial system that supports a moderate run of inside-rearing Chinook salmon. Indices of escapement since 1975 are based on the sum of peak index counts from eight main tributaries (Pahlke 2003). Mark-recapture studies were performed in 1995, 1996, and 2001-2005. The current estimated expansion factor is 4.6 for index counts.



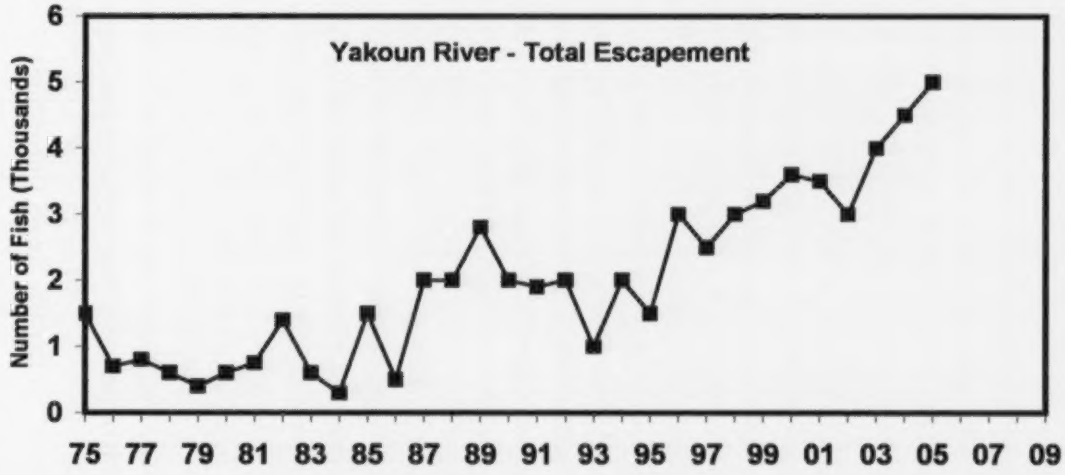
Commentary: The Blossom River is a small-sized non-glacial system that supports a small run of inside-rearing Chinook salmon. Indices of escapement since 1975 are based on the sum of peak index counts (Pahlke 2003). Mark-recapture studies performed in 1998 and 2004 to 2006 estimated an expansion factor range of 2.0 to 4.0. The agency agreed expansion factor is 3.87. In 2009, the survey count was 49% of the lower end of the existing goal range, due to poor survey and survival conditions.



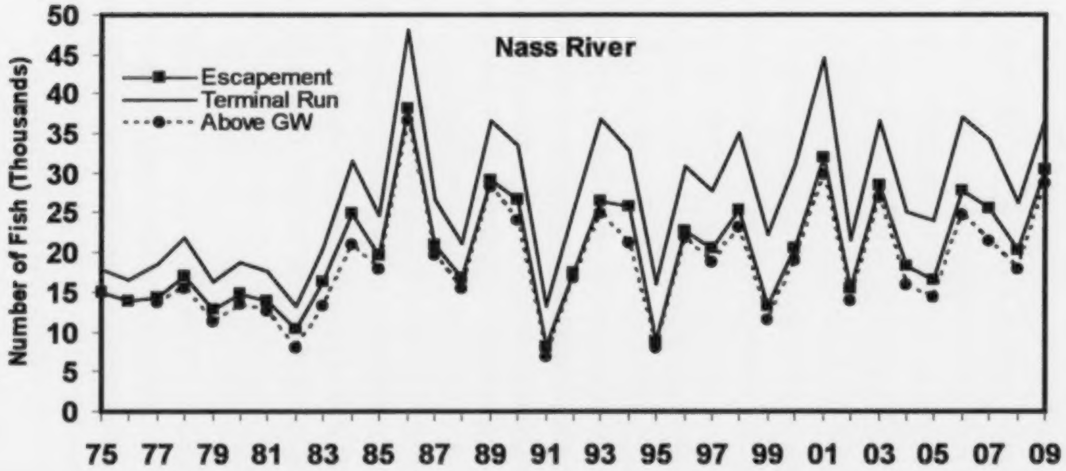
Commentary: The Keta River is a small-sized non-glacial system that supports a small run of inside-rearing Chinook salmon. Indices of escapement since 1975 are based on the sum of peak index counts (Pahlke 2003). Mark-recapture studies were performed 1998 to 2000 (Freeman et al. 2001). The estimated expansion factor is 3.0 for index counts. In 2009, the estimated escapement was 88% of the lower end of the escapement goal range due to poor survey and survival conditions.

2.4.2 Canadian Stocks

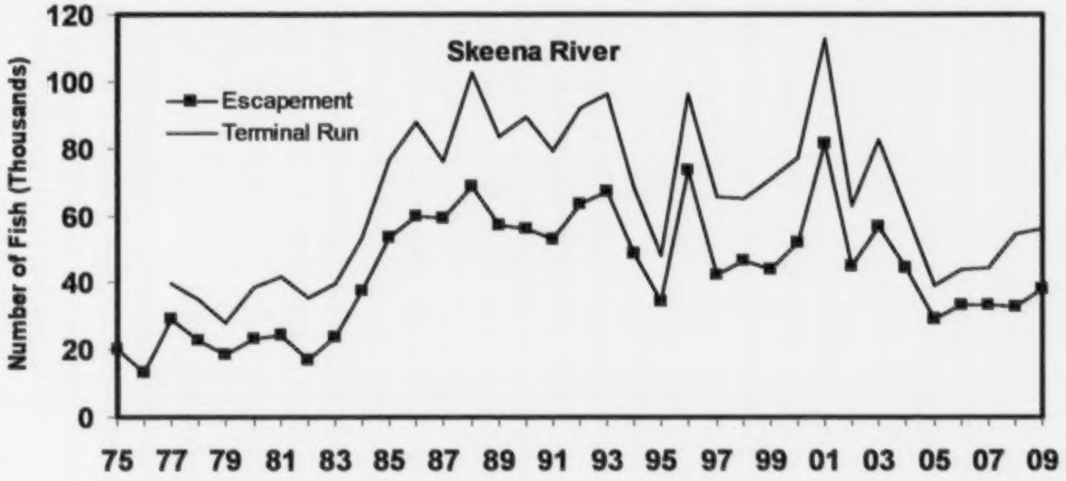
Since the beginning of the Chinook salmon rebuilding program of the 1985 PST, escapement goals for Canadian Chinook salmon stocks were generally based on doubling the average escapements recorded from 1979-1982. The doubling was based on the premise that Canadian Chinook salmon stocks were over-fished and that doubling the escapement would still be less than the optimal escapement estimated for the aggregate of all Canadian Chinook salmon populations (see stock-recruitment curve in "Technical Basis of PSC Catch Ceilings," Figure 1, Attachment 4, PSC file 72006; PSC Office, Vancouver, BC). Doubling was also expected to be a large enough change in escapements to allow detection of the change in numbers of spawners and the subsequent production. The escapement goals of the Canadian stocks are currently being reviewed.



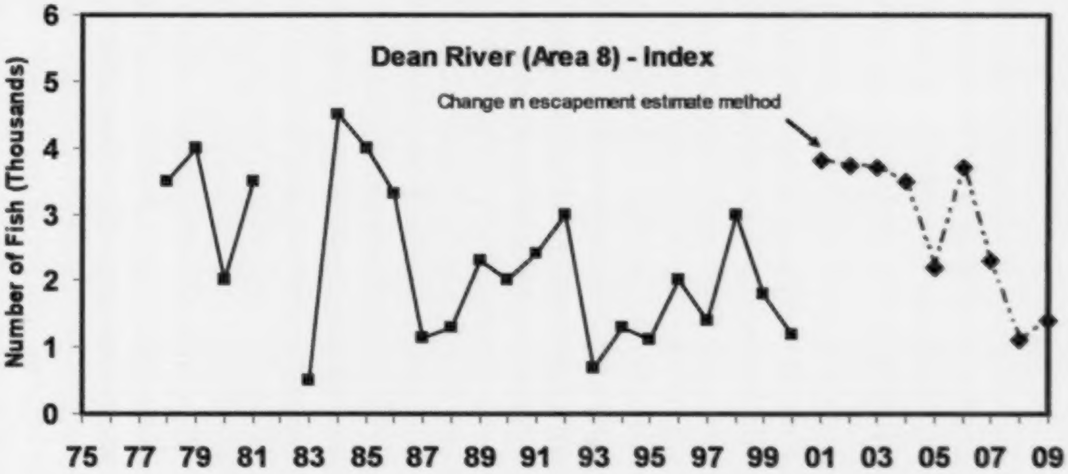
Commentary: The Yakoun River is the only significant Chinook salmon-producing stream on Haida Gwaii (the Queen Charlotte Islands). Chinook salmon spawn primarily at the outlet of Yakoun Lake and are a summer-run stock. Visual estimates of escapement were made by foot surveys of the system. These estimates were then expanded into a total estimate of spawning escapement in the system. The effort spent on escapement surveys declined to 2005 and their accuracy (i.e. ability to estimate the actual escapement) was unknown. Escapement estimates are thought to have exceeded 5,000 Chinook salmon since 2005. However the abundance index has not been continued.



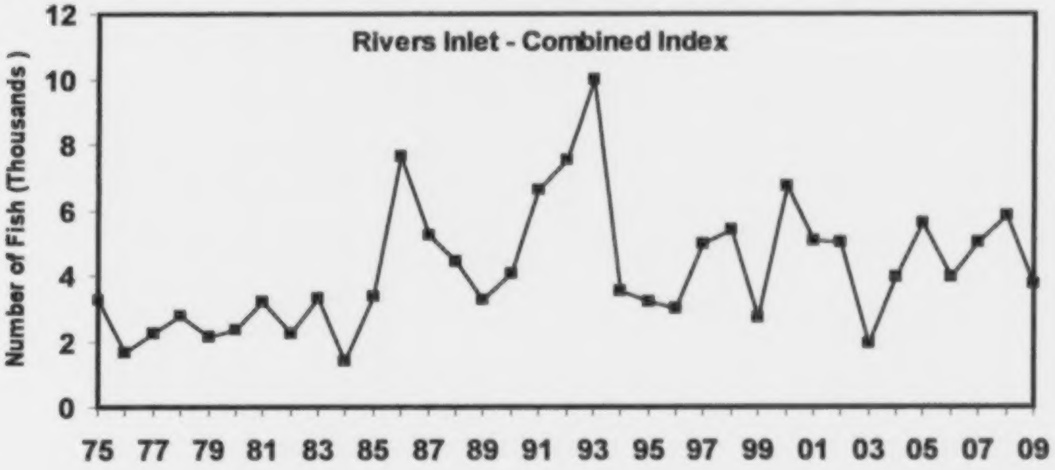
Commentary: The Nass River is the largest river in Area 3, representing a group of approximately 25 streams in Area 3. Prior to 1992, CDFO observations of escapement were based on visual counts. Mark-recapture programs have been conducted since 1992 by the Nisga'a Fisheries to estimate total spawning escapement in the Nass River. The Nass mark-recapture program uses two fish wheels at Gitwinksihlkw (GW) in the lower Nass canyon to apply tags and two wheels at Grease Harbor in the upper canyon and the Meziadin River fishway for recovery. A modified Petersen model was used to estimate the total population of Chinook salmon past the tagging location. Tags were also recovered in upriver fisheries and on the spawning grounds. Spawning escapements were calculated as the estimated Chinook salmon population past GW from the mark-recapture studies, less upriver catches in sport and First Nations fisheries. Three tributaries with Chinook salmon populations enter the Nass River below GW. Visual estimates augmented by fence counts of the Kincolith River in 2001, 2002, 2005 and 2007 were used to estimate Nass River Chinook salmon escapements below the fish wheels.

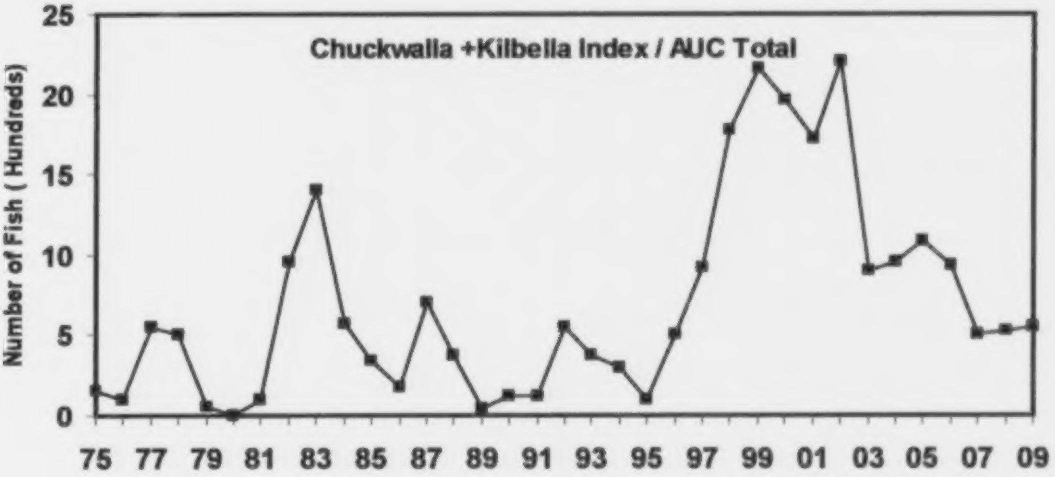


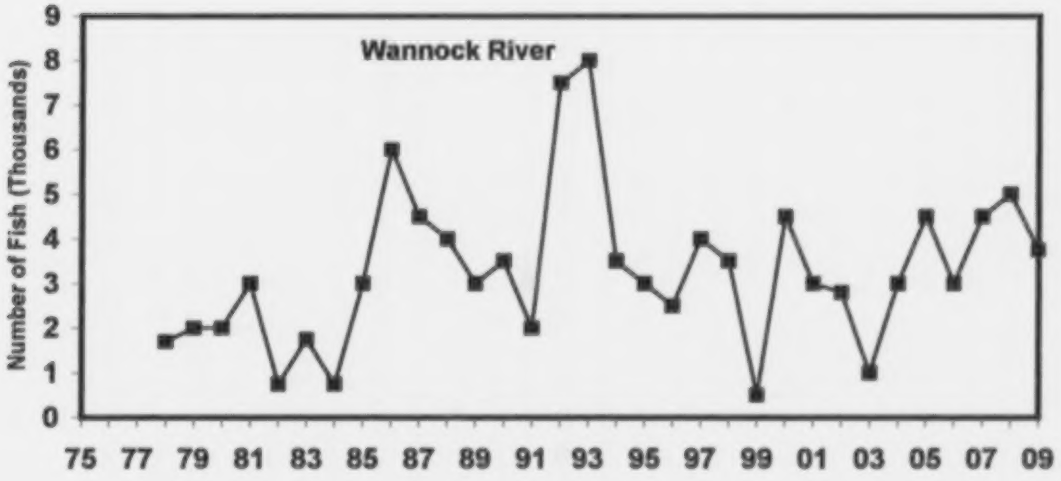
Commentary The Skeena Chinook salmon escapements above represent 40 streams within the Skeena watershed which are consistently surveyed. The Skeena supports over 75 separate Chinook salmon spawning populations, but three (Kitsumkalum, Morice, and Bear Rivers) account for about 70% of the total abundance. A second group of populations (Ecstall, Kispiox, and Babine rivers) have annual returns ranging from 1,000 to 5,000 spawners, and comprise about 13% of Skeena returns. Escapement estimates are generally based on visual observations from helicopter, fixed wing aircraft and/or from stream walking surveys. Fish counting weirs are present on the Babine, Sustut and Kitwanga Rivers. The Kitsumkalum River is the exploitation rate indicator stock for the Skeena Chinook salmon complex. Spawning escapements in the Kitsumkalum have been estimated using a mark-recapture program since 1984.



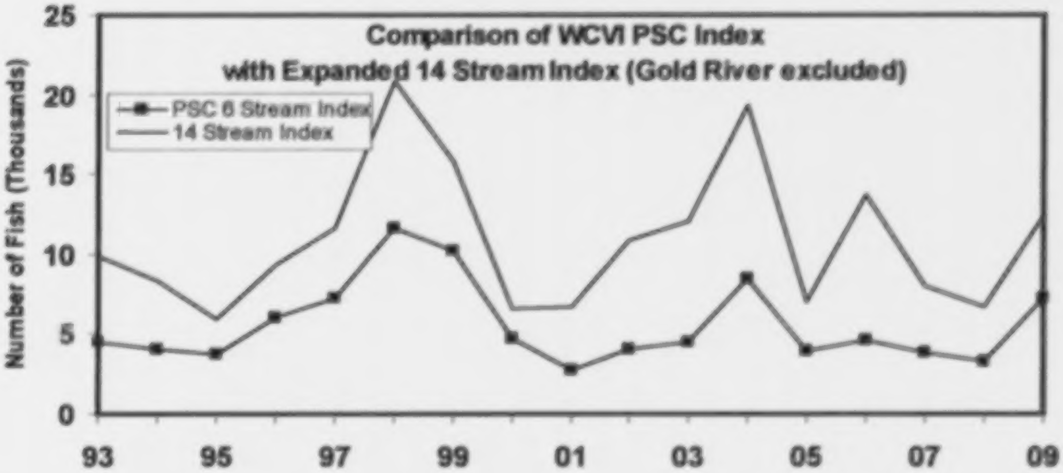
Commentary The Area 8 Chinook salmon stock consists of seven non-enhanced systems, but the Dean River is the main spawning population. Of all Chinook salmon- producing streams in Areas 5 to 10, the Dean is the best indicator in terms of consistent survey coverage and methodology. Chinook salmon returning to the Dean River have early-summer timing and most spawn in the lower river by July. Up until 2000, counts of spawning Chinook salmon were made during 1-3 surveys and the peak count used as the escapement index. Survey counts were sometimes expanded to account for sections of the river that could not be surveyed in any year, but the counts were not extrapolated to total escapement of Chinook salmon to the river. Since 2001, the annual number of aerial surveys has increased, allowing the calculation of area-under-the-curve (AUC) escapement estimates. In some years viewing conditions were poor and did not result in counts necessary to produce an AUC estimate. In these years maximum likelihood estimates were used to produce estimates as was the case in 2004 (3,500). A Chinook salmon mark-recapture program was initiated on the Dean River in 2006 to generate expansion factors for converting the current spawner indices (AUC estimates from helicopter flights) into estimates of total escapement. The preliminary estimate of escapement based on the mark-recapture program was 5,478 in 2006 compared to the maximum likelihood estimate of 3,689. For the purposes of this report however, the index of escapement is reported in the figures.

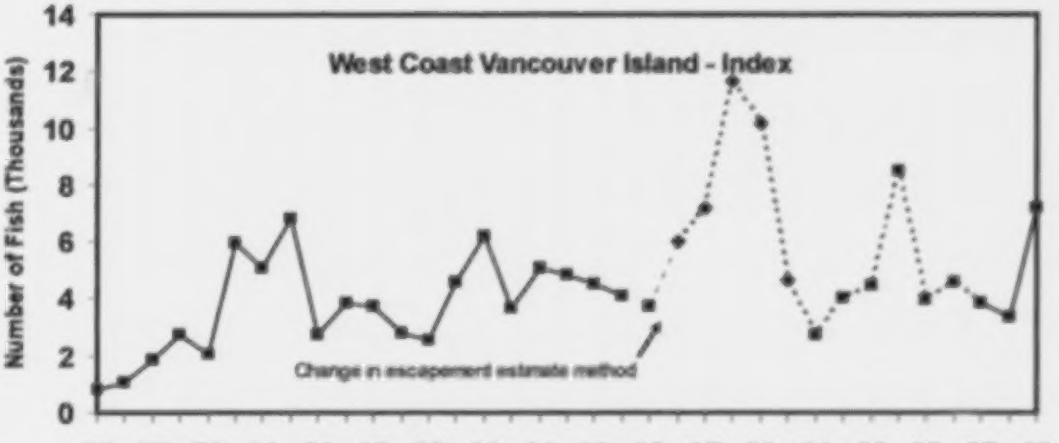




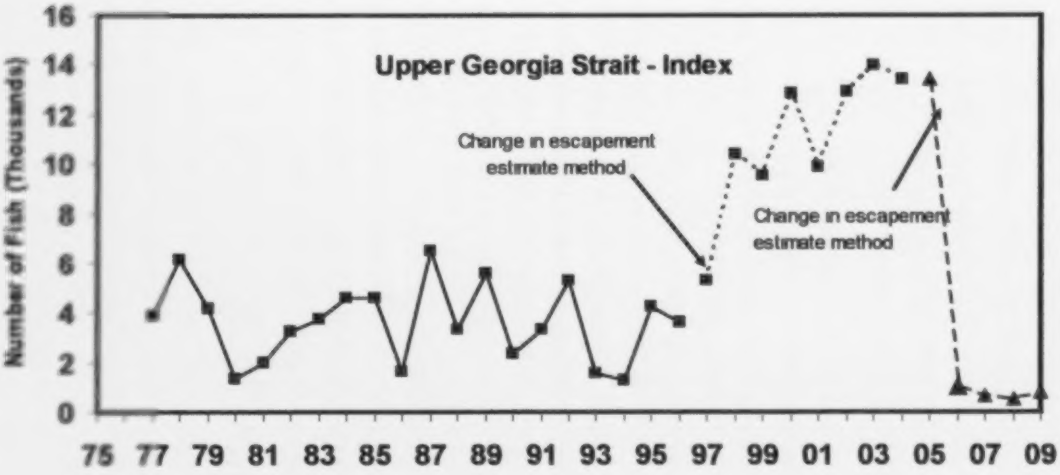


Commentary: The Wannock, Chuckwalla, and Kilbella Rivers are the primary Chinook salmon streams in Area 9 (Rivers Inlet area). Small tributaries of Owikeno Lake also contain Chinook salmon but these populations are much smaller. The Wannock River contains the largest Chinook salmon population, averaging 5,200 Chinook salmon in the 1990s, while the Chuckwalla and Kilbella together averaged around 300. The Wannock River drains Owikeno Lake, is about six kilometers long, and is wide and turbid. The Chuckwalla and Kilbella rivers are much longer, drain from coastal mountains, and their visibility is much more variable depending on local weather (glacial flour to clear). The timing of these stocks also differs: the Wannock has late summer/fall run timing; the other two are early summer Chinook salmon stocks. Escapement estimates in the Chuckwalla and Kilbella rivers are derived from aerial surveys, whereas Wannock escapement is derived from expansions of carcass counts to estimate spawning escapement.

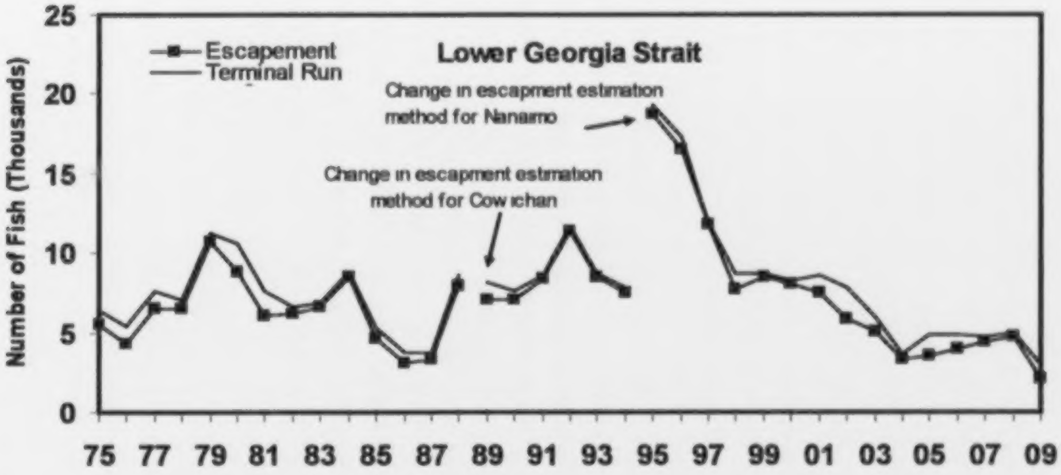




Commentary: The WCVI index represents the sum of escapements for six rivers (Marble, Tahsis, Burman, Artlish, Kaouk, and Tahsish), which were chosen to provide an 'index' of escapement for wild WCVI stocks in general. These stocks were chosen based on historical consistency of data quality. CDFO has developed a 14 stream expanded index which includes escapements to the six stream index plus the following WCVI streams: Colonial/Cayegle Creeks (Area 26), Leiner (Area 25), Megin, Bedwell/Ursus, Moyeha (Area 24) and Sarita, Nahmint (Area 23), and San Juan (Area 21). In 2005, the Colonial/Cayegle escapement was not available, and was therefore not included in the 14 stream index. Since 2007, a mark-recapture program was conducted on the Burman River, in addition to the regular swim and foot surveys. However, the escapement estimate used for the index followed the same methodology since 2005.



Commentary: The Upper Strait of Georgia (UGS) stock index consists of four river systems (Klinaklini, Kakweiken, Wakeman, Kingcome) in Johnstone Strait mainland inlets and the Nimpkish River on northeast Vancouver Island. The accuracy of escapement estimates in the mainland inlet systems is likely poor due to low visibility of glacial systems, remote access, and timing of surveys. Escapement estimates have primarily been based on aerial counts which may not encompass Chinook salmon run-timing. Swim surveys and stream walks have been conducted in the Nimpkish River. A fish wheel program implemented on the Klinaklini in 1997 was discontinued in 2004. Based on the portion of the assessment program that continued in 2005, estimated abundance in 2005 was assumed to be the same as in 2004. Since 2006, the accuracy of the escapement estimate for the Klinaklini is considered to be very poor. Consequently, escapement for this stock was not included in the 2006 or 2007 index. No fish were observed in the Kakweiken River in 2006 or 2007.



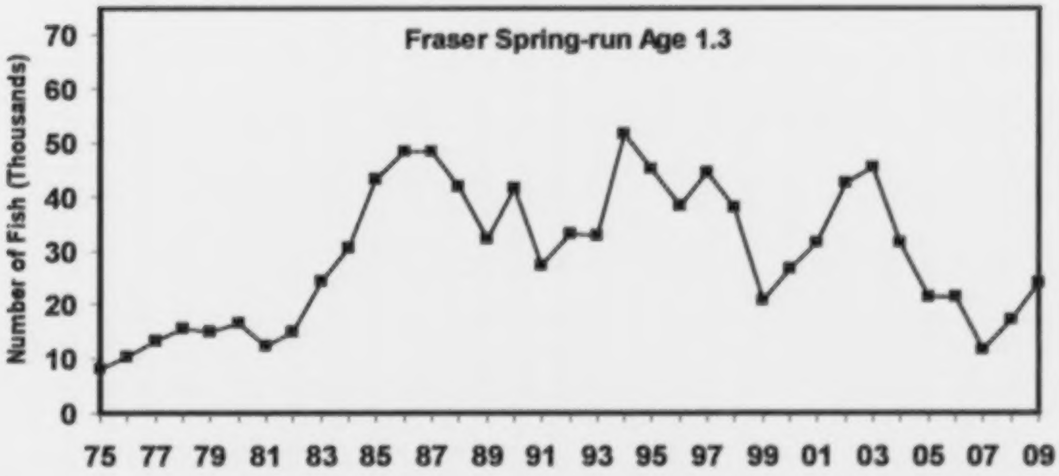
Commentary: Lower Strait of Georgia (LGS) rivers monitored for naturally spawning fall Chinook salmon escapement are the Cowichan and Nanaimo rivers. Total Chinook salmon returns to the Cowichan and Nanaimo rivers have been estimated since 1975. Prior to 1988, escapement estimates from the Cowichan River were derived from swim and aerial surveys. This approach was also used for the Nanaimo River prior to 1995. Since 1988 a counting fence has been used in the Cowichan River, and since 1995 carcass mark-recapture surveys have been used in the Nanaimo River. Since 2005, AUC estimates have been used in the Nanaimo River and a tagging study was used to determine survey life in 2006. An escapement goal of 6,500 for the Cowichan River was accepted by the CTC in 2005; a goal for the Nanaimo is still pending.

2.4.3 Fraser River Stocks

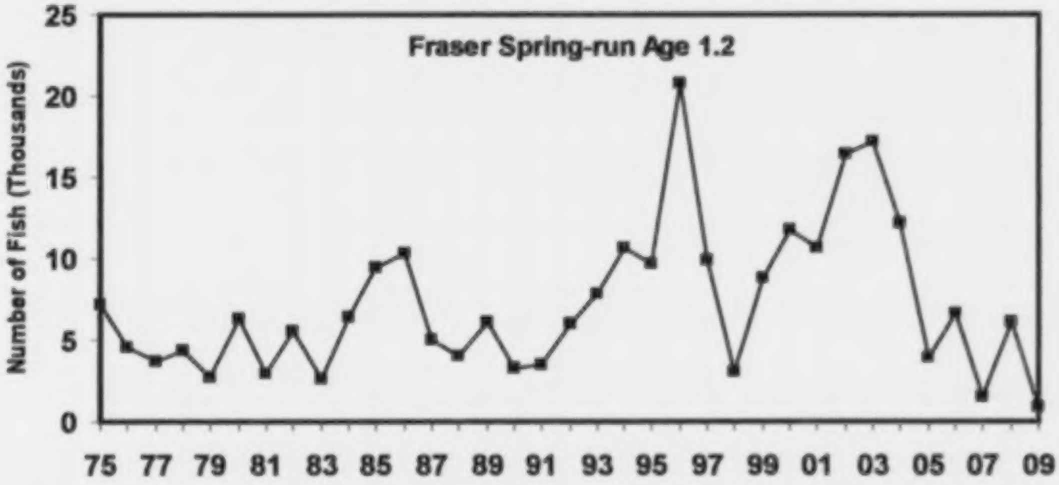
The Fraser River watershed is the largest Canadian producer of Chinook salmon. Fraser Chinook salmon consist of many local populations as described in CTC (2002b).

Much of the knowledge about the status of Fraser Chinook salmon is based on spawner escapement data. Most data are from visual surveys, which are generally biased low, although many estimates are considered to be reasonably precise. Visual survey data are generated from aerial surveys and the escapement estimate is usually obtained by dividing the peak count by 0.65 (Farwell et al. 1999). The CDFO continues to evaluate the appropriateness of this expansion factor and AUC methodology through calibration studies. Counting fences and mark-recapture projects exist for some systems, although most of the time series of escapement data from these projects are relatively short.

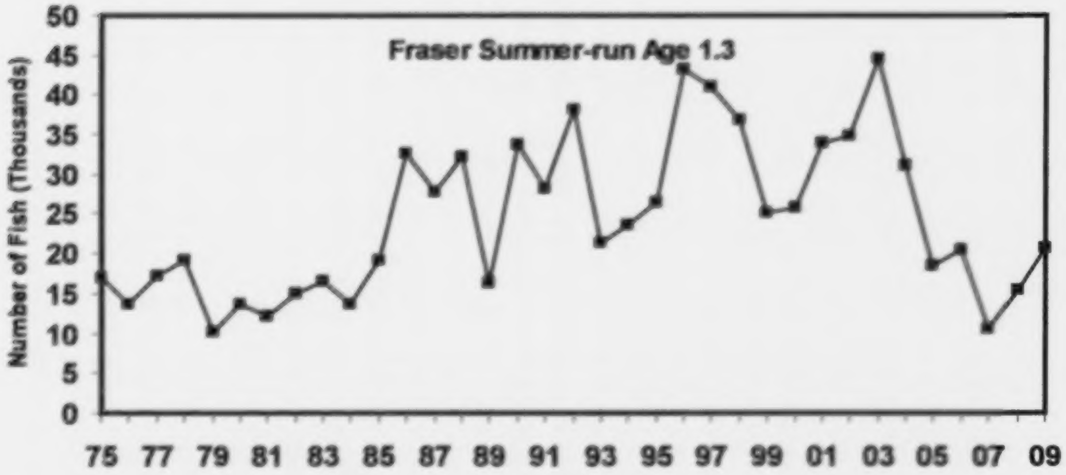
For populations other than the Harrison River, habitat-based models are being developed to estimate spawning capacity and spawner abundance producing maximum sustained yield. This habitat-based assessment will initially focus on predictive models based on Chinook salmon stock-recruitment relationships, although other habitat-based approaches will also be considered.



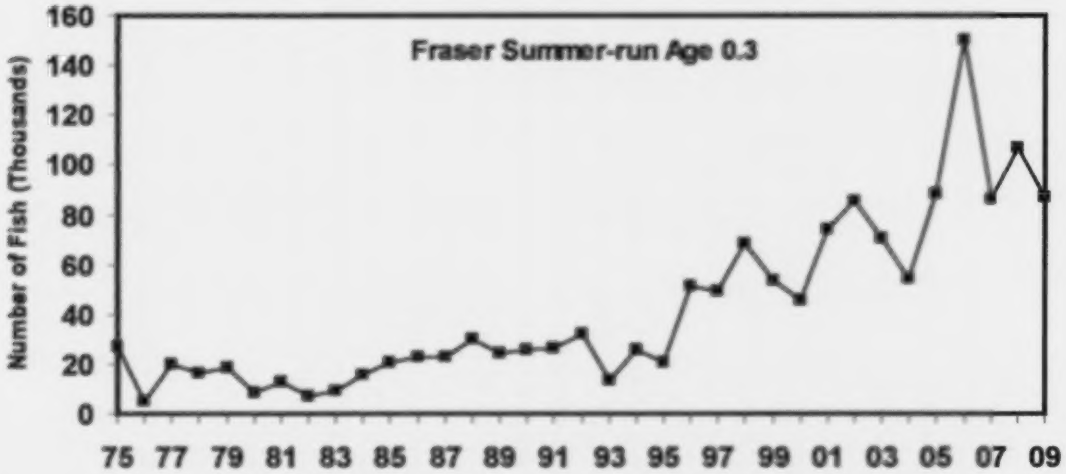
Commentary: The Fraser Spring-Run Age 1.3 aggregate includes the Upper Pitt River and Birkenhead River stocks in the Lower Fraser, and the spring-run stocks of the Mid and Upper Fraser, North Thompson, and South Thompson, but excluding those of the Lower Thompson tributaries (CTC 2002b). Escapements improved slightly again in 2009, however, they still failed to exceed the parental brood escapement levels in 2004. Escapement to the aggregate was estimated at 24,150 in 2009; roughly 76% of the brood year escapement in 2005..



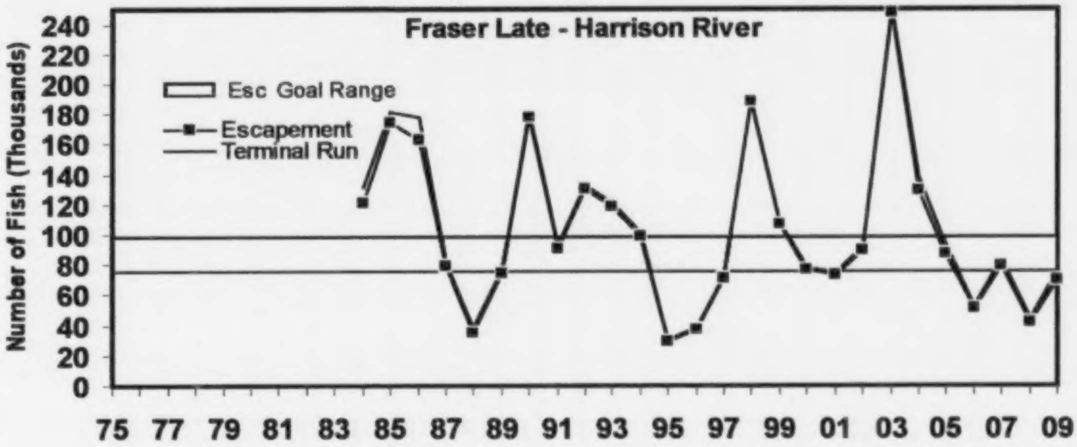
Commentary: The Fraser Spring-Run Age 1.2 aggregate includes six smaller body size populations that spawn in the Lower Thompson River tributaries, Louis Creek of the North Thompson and the spring-run fish of Bessette Creek in the South Thompson (CTC 2002b). . Escapements again declined substantially in 2009, and cumulatively represent the lowest levels ever recorded for this aggregate (911), and only 23% of the 2005 parental brood escapements. Escapements were critically low at Louis Creek (6) and Coldwater River (26), while Nicola was also the poorest on record at 479.

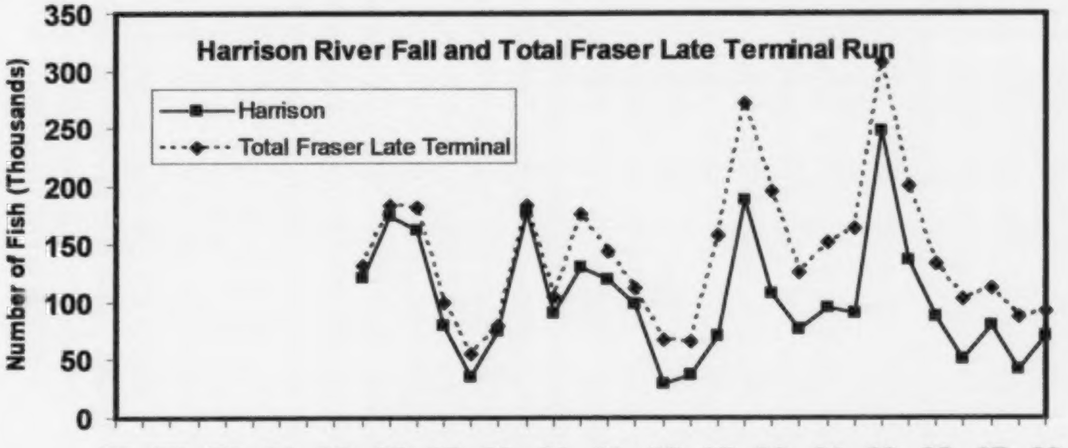


Commentary: The Fraser Summer-Run Age 1.3 aggregate includes 10 populations, spawning in large rivers, mostly below the outlets of large lakes. These include the Nechako River Chilko and Quesnel rivers in the mid Fraser and the Clearwater River in the North Thompson watershed (CTC 2002b). Escapement surveys of the Stuart River and North Thompson River were discontinued in 2004 due to unreliable counting conditions. Escapements in 2009 again improved slightly over 2008; however they still represent significant declines when compared to the brood year escapements in 2004. Aggregate escapement was estimated at 20,619, roughly 67% the 2004 parental brood escapement.



Commentary: The Fraser Summer-Run Age 0.3 aggregate includes six populations spawning in the South Thompson watershed upstream of Kamloops and one in the lower Fraser. These include the Middle Shuswap, Lower Shuswap, Lower Adams, Little River and the South Thompson River mainstem, in the BC interior, and Maria Slough in the lower Fraser (CTC 2002b). Escapements to the Summer Run Age 0.3 aggregate were modest (86,443) in 2009, although they declined from levels observed in 2008 (106,539). The 2009 escapements represent approximately 96% of the parental brood year escapements in 2005.



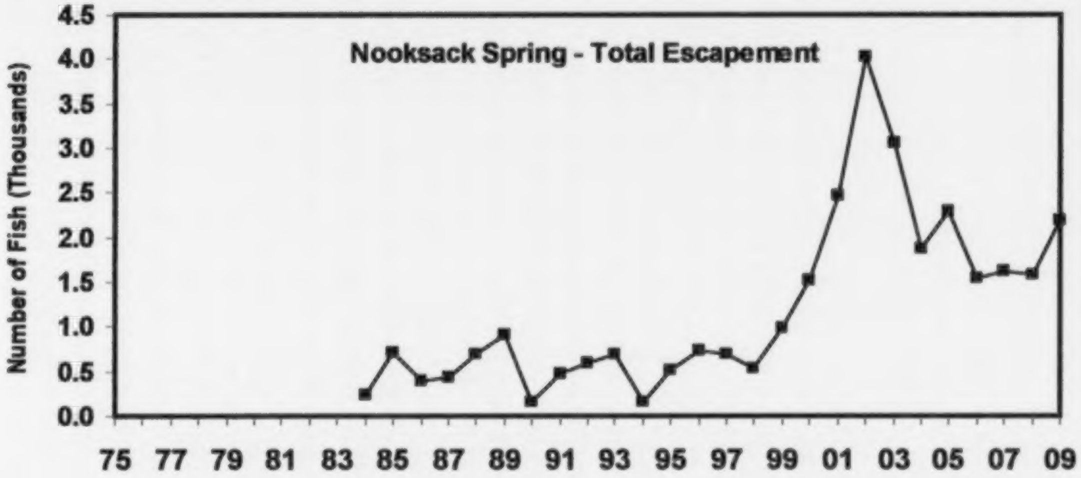


Commentary: The Fraser late stock is dominated by fall returning Harrison-origin Chinook salmon that includes natural spawners in the Harrison River and Harrison-origin fish that were introduced to the Chilliwack River. Since 1984, mark-recapture studies have been conducted annually on the Harrison River to obtain reliable estimates of spawning escapements. Estimates of fall Chinook salmon escapement to the Chilliwack River are based on a procedure long established by the Chilliwack Hatchery staff for expanding the number of carcasses counted in standardized reaches of the river. Spawning escapements to the Harrison River in 2009 were estimated to be 70,119 adult Chinook salmon, and 86,282 jacks. Total fall Chinook salmon escapements to the Chilliwack River were estimated to be 21,308 adults and 13,465 jacks.

Washington, Oregon and Columbia River Stocks

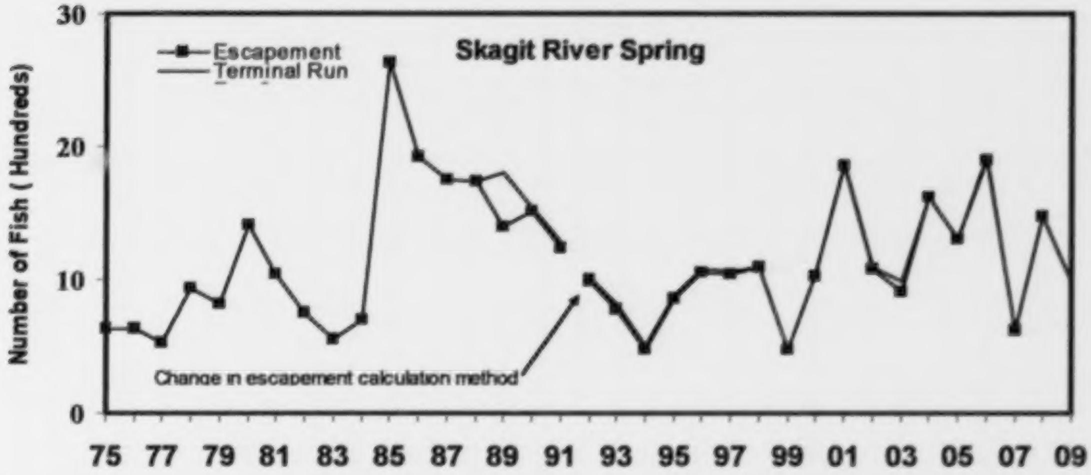
The PSC escapement indicator stocks in Washington, Oregon, and Idaho are separated into five groups: Puget Sound, Washington Coastal, Columbia River, North Oregon Coastal, and Mid Oregon Coastal. The indicator stocks include a variety of run timings and ocean distributions.

Biologically based escapement goals have been reviewed and accepted by the CTC for three fall stocks (Queets, Quillayute, Hoh), two Spring/summer stocks (Queets, Hoh), three Columbia River stocks (Lewis, Upriver Brights and Columbia River summer), and three Oregon coastal stocks (Nehalem, Siletz and Siuslaw).



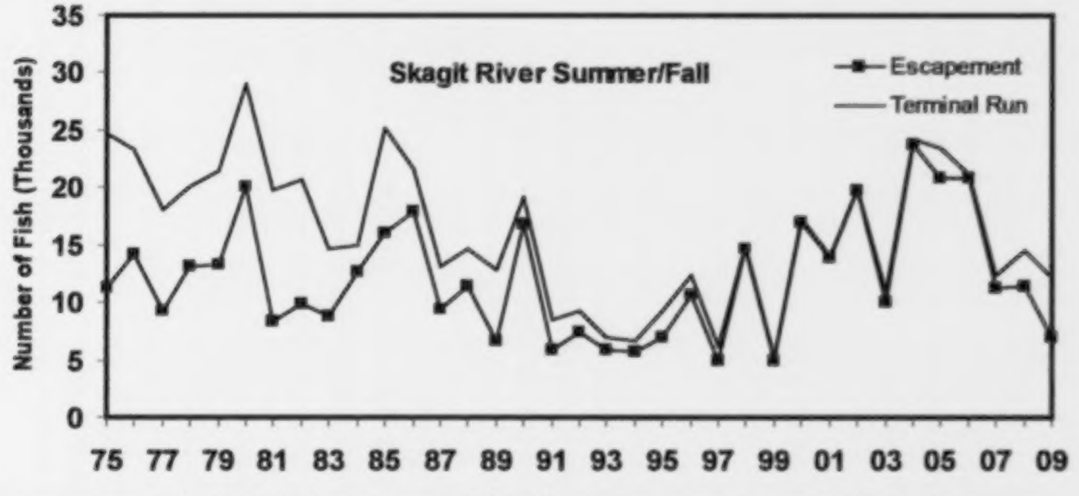
Commentary: The Nooksack spring Chinook management unit includes early-timed Chinook populations returning to the North and South forks of the Nooksack River. Because the 2009 escapement of natural-origin Nooksack early Chinook was projected pre-season to be below the lower abundance threshold (LAT) of 2,000 natural-origin spawners, the critical exploitation rate ceiling (CERC) of 6.6% in southern U.S. fisheries was used in pre-season planning (See WDFW and PSTT (2010) for details on 2009 objectives for all Puget Sound Chinook units). The pre-season projection of southern U.S. ER on Nooksack early Chinook was 2.3%. Post-season exploitation rate (ER) estimates are not yet available.

Total spring Chinook escapement to the Nooksack is estimated by a combination of redd count and carcass count expansions. In 2009 total escapement was estimated to be 2,356 (1,903 to the North Fork and 453 to the South Fork). Carcass sampling and otolith analysis of carcasses in the North Fork showed that an estimated 246 of the 1,903 Chinook were natural-origin recruits. DNA analysis of carcasses in the South Fork showed that an estimated 45 of the 453 Chinook were South Fork natural-origin, with the remainder being a mix of hatchery-origin, North Fork natural-origin, and fall stock natural-origin recruits.



Commentary The Skagit spring Chinook management unit includes early-timed Chinook populations returning to the Upper Sauk, Cascade, and Suiattle rivers in the Skagit basin. The Upper Management Threshold (UMT) for Skagit spring Chinook is 2,000. In 2009 the conservation objective for Skagit springs was an AEQ exploitation rate in all fisheries not exceeding 38%. While a postseason estimate is not yet available, the preseason projection for 2009 was for a total rate of 33.5%.

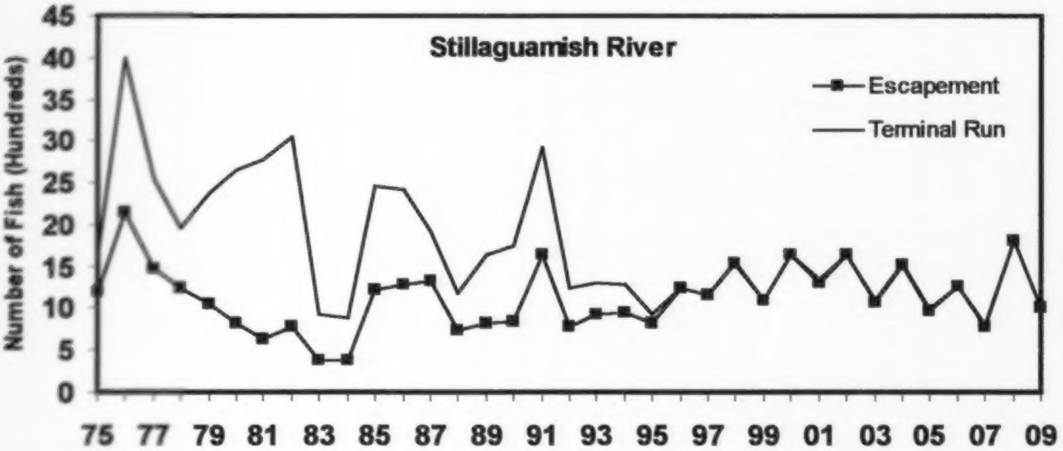
Due to changes in spawning index areas, beginning in 1992 for the Cascade stock and 1994 for the Sauk and Suiattle stocks, escapements are not directly comparable to previous numbers. Escapement is estimated by expansion of total redd counts for the season. The 2009 total escapement estimate for Skagit spring Chinook was 978 spawners.



Commentary: The Skagit River summer/fall Chinook management unit includes the Upper Skagit summer, Sauk summer, and Lower Skagit fall Chinook populations. The UMT for Skagit summer/fall Chinook is 14,500. In 2009, the conservation objective for this unit was an AEQ

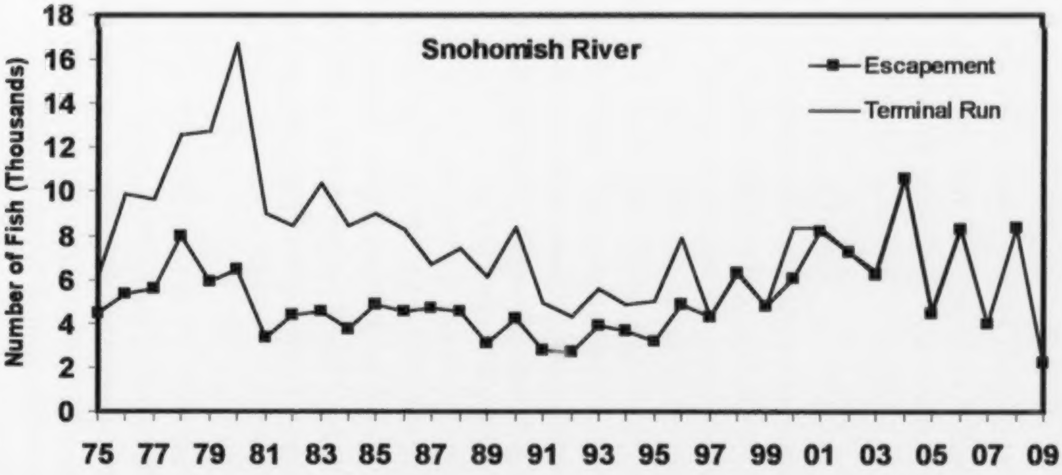
ER in all fisheries not exceeding 50%. The preseason projected total ER was 48.6%. The postseason estimate is not yet available.

Escapement of Skagit summer/fall Chinook was estimated using expansion of redd counts from helicopter surveys of mainstem areas and foot surveys of smaller tributaries. Total escapement to the system in 2009 was estimated to be 6,955 spawners.



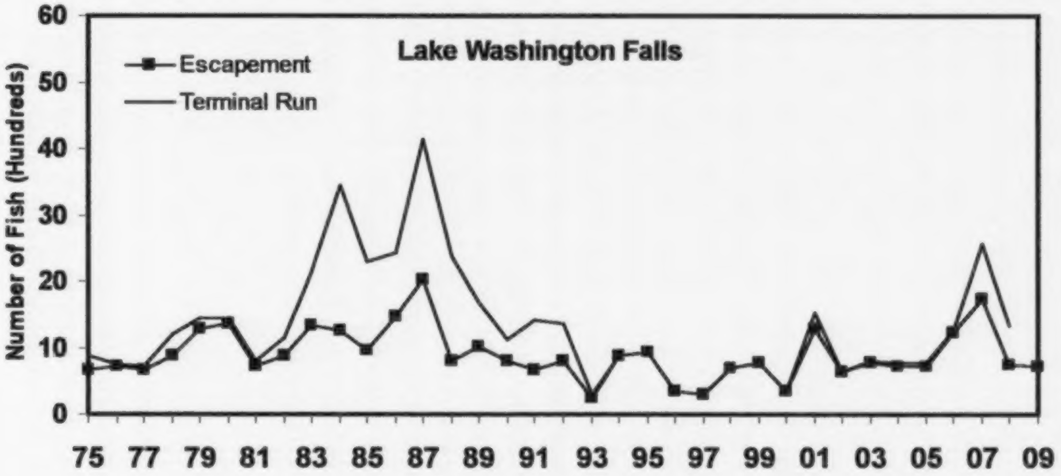
Commentary: The Stillaguamish Chinook management unit includes the summer Chinook population spawning in the North Fork, and the fall Chinook population spawning in the South Fork and Mainstem of the Stillaguamish. The UMT for the management unit is 900 natural-origin spawners. In 2009 the conservation objective for Stillaguamish Chinook was an AEQ ER in all fisheries not exceeding 25%. While a postseason estimate is not yet available, the preseason projection for 2009 was for a total rate of 22.7%.

Escapement estimates for Stillaguamish Chinook were based on redd-count expansions. Total natural spawning escapement in 2009 was estimated to be 1,001. The North Fork summer Chinook estimate was 958 fish, of which 431 were natural-origin. An additional 156 fish were collected for use as broodstock to maintain a CWT indicator program and to augment natural production. The South Fork fall escapement estimate was 43 fish. No estimate of hatchery/natural-origin composition is available.



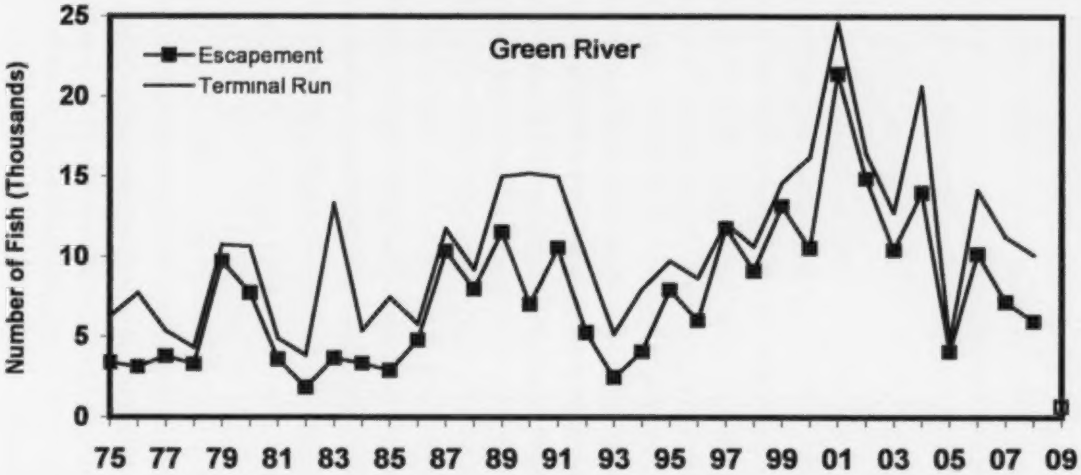
Commentary The Snohomish Chinook management unit includes the Skykomish and Snoqualmie summer/fall Chinook populations. The UMT for the management unit is 4,600 natural-origin spawners. In 2009, the management objective for Snohomish Chinook was the CERC of 15% in southern U.S. fisheries, due to the projected rate in northern fisheries exceeding the difference between the unit's rebuilding exploitation rate and critical exploitation rate ceilings (WDFW and PSTT, 2010). The pre-season projected ER in southern U.S. fisheries was 14%.

Escapement was estimated using expansion of redd counts conducted by a combination of helicopter, float, and foot surveys, and from fish counts at the Sunset Falls fishway. Escapement was estimated to be 1,414 for the Skykomish population and 895 for the Snoqualmie population, for a total of 2,309. No estimate of natural/hatchery-origin composition is available.



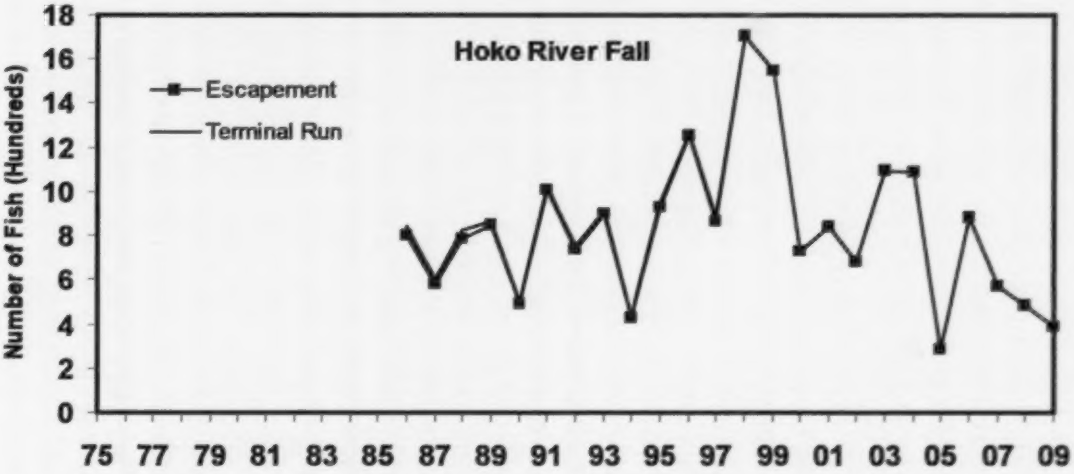
Commentary The Lake Washington Chinook management unit includes the Cedar River and North Lake Washington tributary fall Chinook populations. The UMT for Cedar River Chinook in 2009 was 1,200 natural-origin spawners. The management objective in 2009 was an AEQ ER rate in pre-terminal southern U.S. fisheries not exceeding 15% on Cedar River Chinook. The pre-season projection was for a southern U.S. pre-terminal ER of 10.7%.

Chinook escapement in the Cedar River is estimated using expansion of total redd counts. In 2009, escapement was estimated to be 713 Chinook. Approximately 20% of those spawners were marked hatchery strays. Escapement to the North Lake Tributaries is estimated using live counts and area under the curve (AUC) methods, and counts of fish passed above the rack at the Issaquah Hatchery. Natural spawning escapement was estimated to be 1,161, with an additional 847 released above the hatchery rack. Hatchery/natural-origin composition estimates are not yet available for the North Lake Tributary spawners.



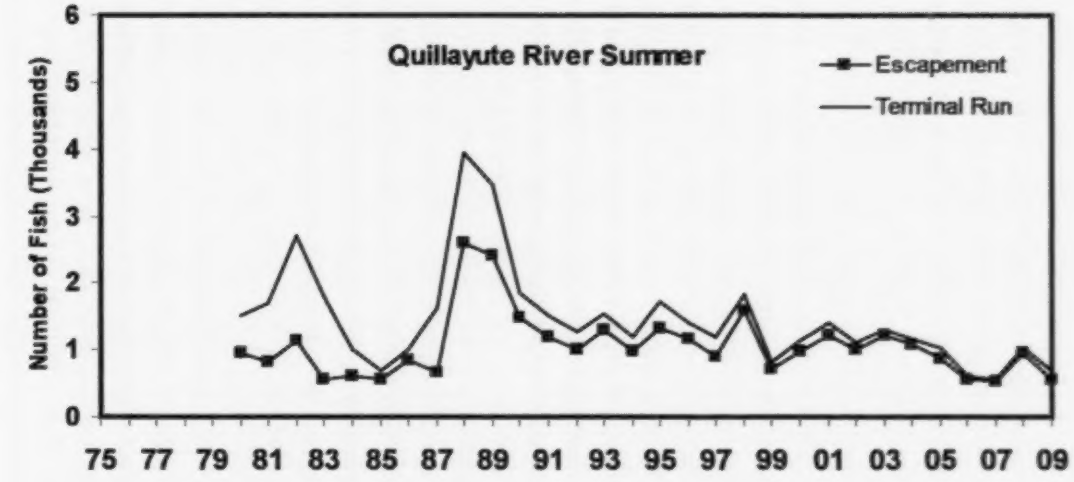
Commentary The Green River Fall Chinook management unit consists of a single population spawning in the mainstem Green River and two of its major tributaries. The UMT for the population is 5,800 spawners. In 2009, pre-terminal southern U.S. fisheries were planned for an ER not to exceed 15% (projected to be 10.7%), and terminal fisheries were planned to allow the escapement goal of 5,800 to be met.

Escapement to the Green in 2009 was estimated using an expansion of redd counts. Redd surveys were complicated by escapement of pink salmon in excess of 2 million to the system, which interfered with counts of Chinook redds, and shortened redd life to less than 7 days. Total escapement was estimated to be 688 Chinook, the lowest estimate in recent history. Because escapement was small, the 2009 estimate was based on a complete census of redds, rather than by the index expansion method used in years of higher abundance. Despite the uncertainty caused by the large pink salmon abundance, this low estimate of natural escapement reflects a real decrease in escapement, and was likely the result of two factors. First was the small natural smolt outmigration produced by the 2006 parent spawning escapement. Second was an unusually low rate of straying of hatchery fish produced by the Soos Creek hatchery to the spawning grounds. The 2009 return of adult Chinook to the hatchery rack was similar to recent years, yet for reasons unknown, far fewer hatchery-origin fish spawned naturally in the river than in those years.

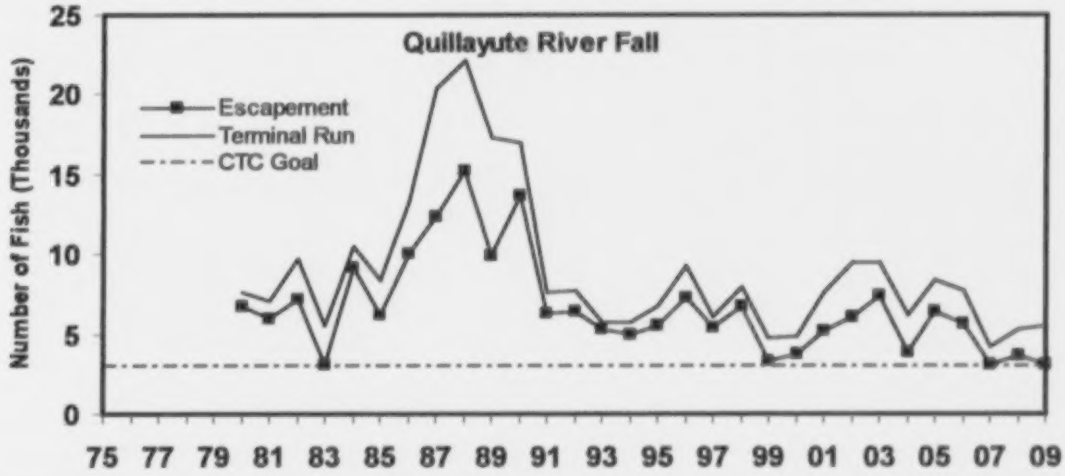


Commentary Hoko River fall Chinook spawn primarily in the mainstem of the Hoko, with limited spawning in larger tributaries. The UMT for the population is 850 spawners. The 2009 management objective was an ER not exceeding 10% in southern United States fisheries. Post-season ER estimates are not yet available, but the pre-season projection was an ER of 4.8% in southern U.S. fisheries.

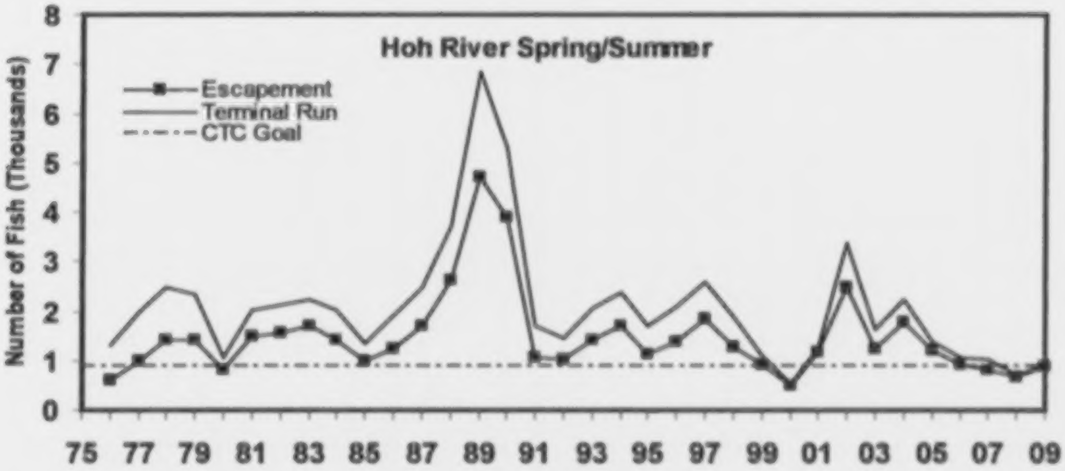
Chinook escapement to the Hoko is based on redd count expansion. In 2009, total natural spawning escapement was estimated to be 103. An additional 282 Chinook were collected for use as broodstock in the supplementation program.



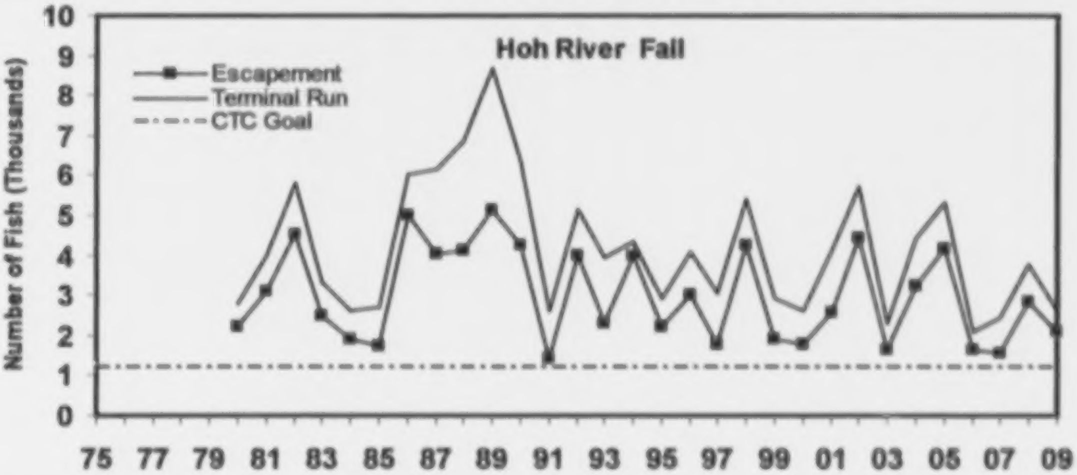
Commentary: A summer Chinook salmon hatchery program using native stock operated from the mid-1970s to the mid-1980s. Spring Chinook salmon of non-native origin were introduced in a hatchery program in the early 1970s. CWT analyses since then have demonstrated significant straying of these spring Chinook salmon into the summer Chinook salmon spawning population. Estimates from 1991-1995 averaged 47% hatchery origin strays in the naturally spawning population. In 1996, fry plants were eliminated and the smolt plants were reduced. Summer Chinook salmon are managed for a fixed escapement goal of 1,200 adults and jacks combined (PFMC 2003). The 2009 escapement estimate for summer Chinook salmon was 555.



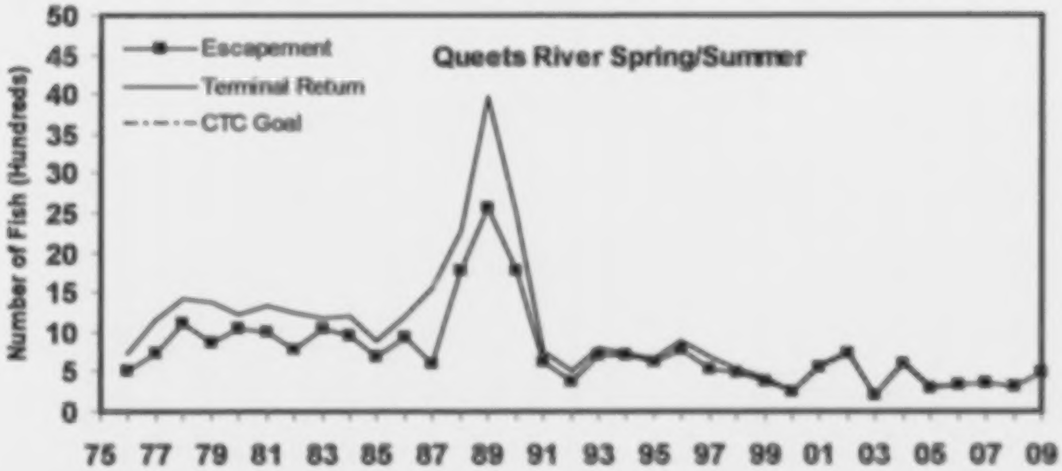
Commentary: No hatchery production of fall Chinook salmon currently occurs in the Quillayute River basin; the program was discontinued in the late 1980s. Since 1991, the returning run size has fluctuated within a range comparable to run sizes observed prior to 1984. The 2009 escapement estimate was 3,085, with a total terminal estimate of 5,494. Terminal fisheries are managed for a harvest rate of 40%, with an escapement floor of 3,000 fish (PFMC 2003). This objective is designed to actively probe at and above estimates of escapements that produce maximum sustained harvest (MSH), while minimizing potential detrimental effects of existing fisheries. Stock production analyses of spawning escapements from 1968-1982 were used to determine the initial escapement floor.



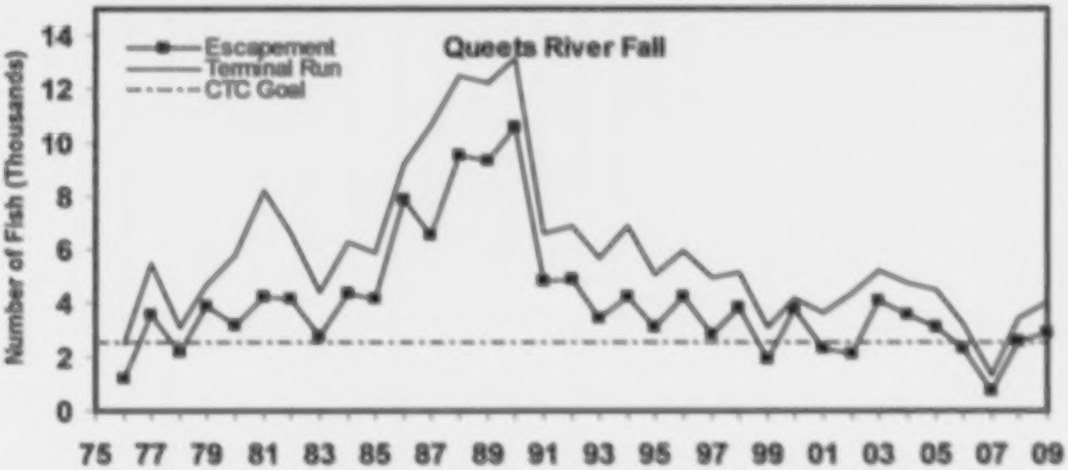
Commentary: Similar to many of the other Washington coastal stocks, Hoh River spring/summer escapements have been relatively stable except for much larger returns in 1988, 1989, and 1990. The terminal return for this stock declined from 1997 to 2000, had rebounded in 2001 before declining again since 2005. Terminal fisheries are managed to harvest 31% of the river run, with an escapement floor of 900 fish (PFMC 2003). This objective is designed to allow a wide range of spawner escapements from which to eventually develop an MSY objective or proxy while protecting the long-term productivity of the stock. Stock production analysis of spawning escapement for brood years 1969-1976 was utilized to determine the initial escapement floor. The 2009 escapement estimate and total run size were 880 and 913 respectively.



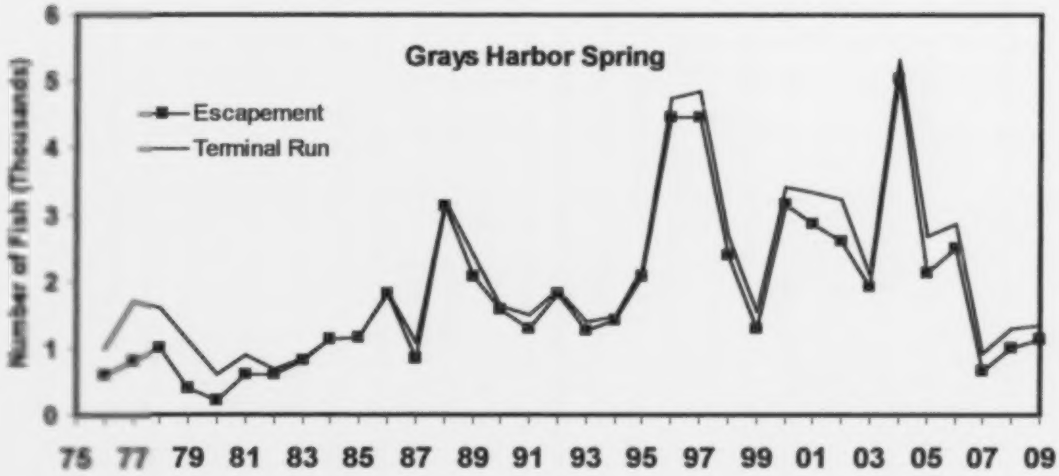
Commentary: The natural escapement estimates for the Hoh River fall Chinook salmon include fish taken for broodstock in the 1980s. This stock is managed to harvest 40% of the terminal run, with an escapement floor of 1,200 spawners (PFMC 2003). This objective is designed to actively probe at and above estimates of the escapements that produce MSH, while minimizing potential detrimental effects of existing fisheries. Stock production analyses of spawning escapements from 1968-1982 were utilized to determine the initial escapement floor. The 2009 escapement estimate was 2,081. Terminal run size estimate was 3,613.



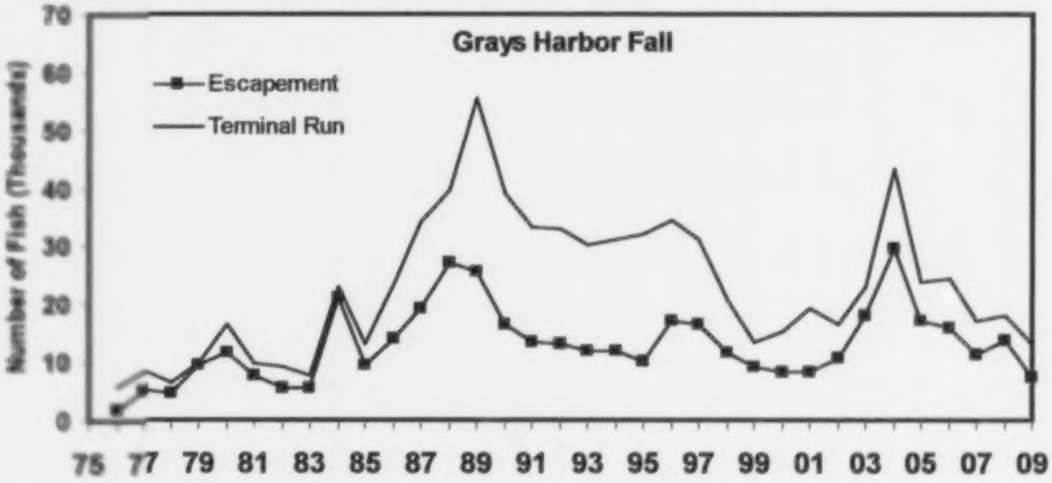
Commentary: Terminal fisheries are managed to harvest 30% of the river run size, with an escapement floor of 700 fish (PFMC 2003). This objective is designed to actively probe at and above the estimates of escapement that produce MSH. Since 1990, terminal fisheries have had minimal impact on this stock as returns to the river have rarely exceeded the escapement floor in this time frame. Since 2000, sport anglers have been required to release all Chinook salmon during the summer, and tribal fisheries have been limited to one tribal netting day for ceremonial and subsistence purposes. Stock production analysis of spawning escapement for brood years 1969-1976 were used to determine the initial escapement floor. The 2009 escapement estimate was 495, with a terminal run size of 495.



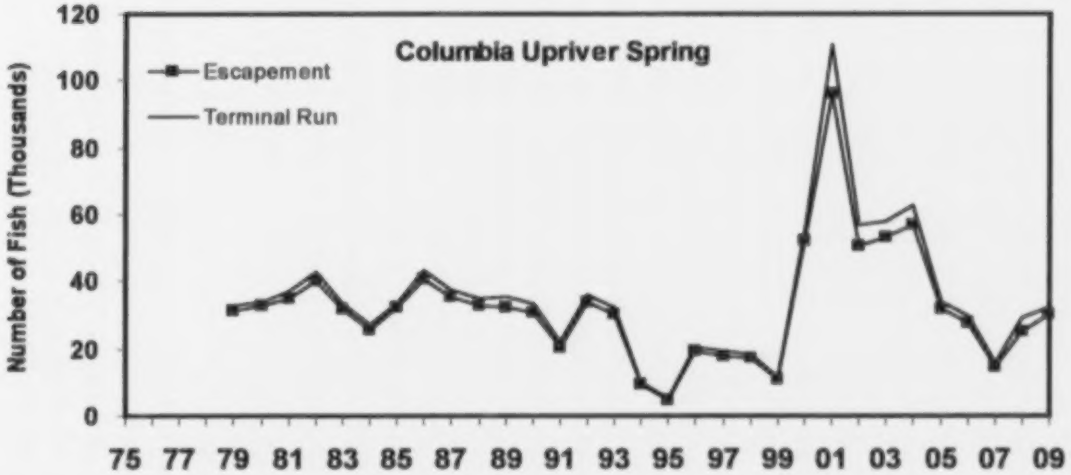
Commentary: For Queets River fall Chinook salmon, the 2009 escapement was 2,909 and the terminal run was 4,061. Terminal fisheries are managed to harvest 40% of the river return, with an escapement floor of 2,500 spawners (PFMC 2003). This objective is designed to actively probe at and above estimates of the escapements that produce MSH. Stock production analyses of spawning escapements from 1967-1982 were used to determine the initial escapement floor.



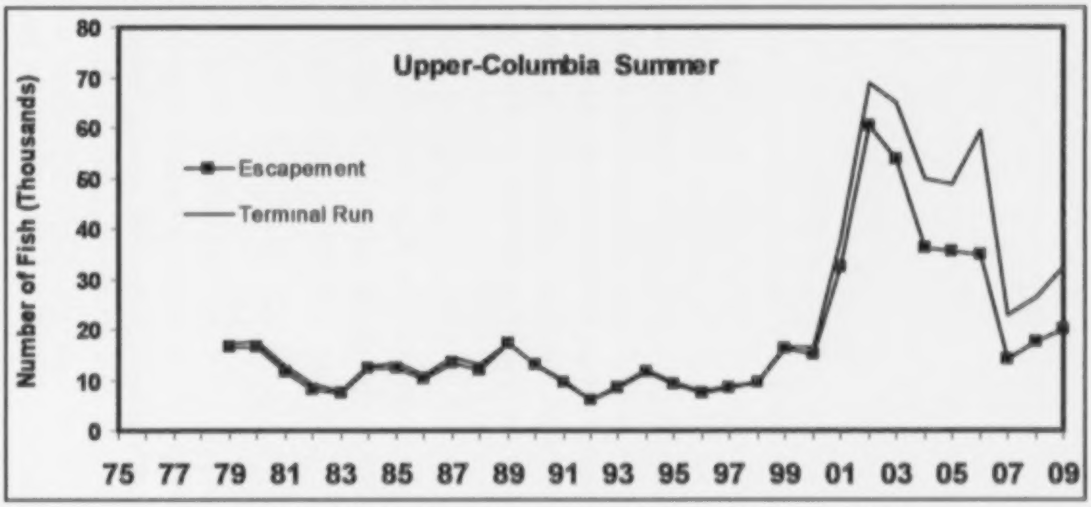
Commentary: The Grays Harbor spring Chinook salmon stock is managed for a fixed natural spawning escapement goal of 1,400 fish (PFMC 2003). This single targeted goal was developed as a MSY proxy. This objective was derived from actual spawning data from the mid- to late 1970s, expanded to include additional habitat not covered by spawner surveys. The 2009 escapement was 1,123 Chinook salmon and the 2009 terminal run 1,348.



Commentary: Grays Harbor fall Chinook salmon are managed for a maximum sustained production escapement goal of 14,600 spawners for the Chehalis and Humptulips systems combined (PFMC 2003). This single targeted goal was developed as an MSY proxy. The objective represents assumed optimal spawner density based on estimated available habitat. The 2009 escapement was 7,166 Chinook salmon. The terminal run was 13,145 Chinook salmon.



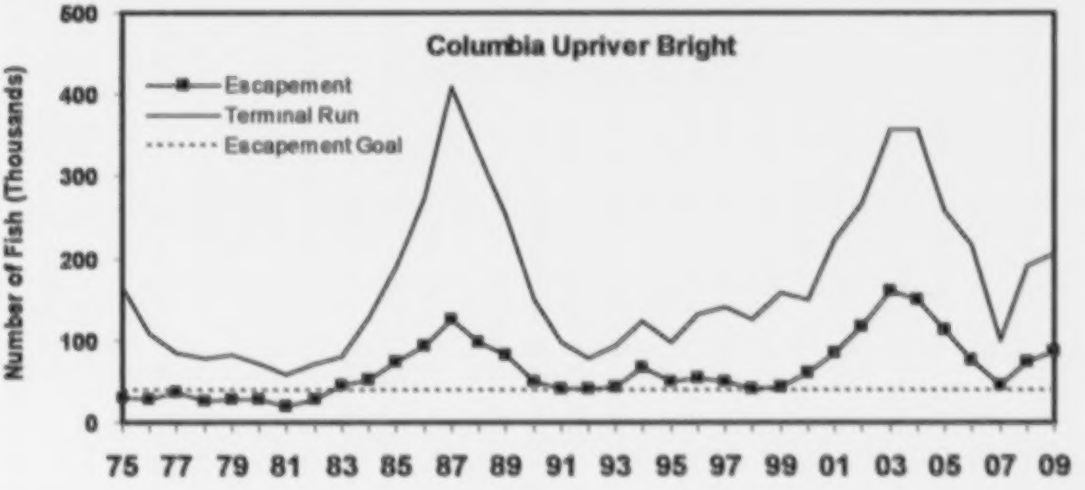
Commentary: The upriver spring/Snake River spring/summer Chinook salmon escapement in the graph was calculated as the dam count at Bonneville Dam from January 1 through June 15 multiplied by the estimated proportion wild, minus harvests above Bonneville Dam multiplied by the estimated proportion wild. In 1992, Snake River spring/summer naturally spawning Chinook salmon were listed under the ESA. The interim management goal for the Columbia River Fish Management Plan (CRFMP 1988) for Columbia River Springs was 115,000 hatchery and wild adult Chinook salmon counted at Bonneville Dam and 25,000 naturally produced plus 10,000 hatchery produced adults counted at Lower Granite Dam. Under the 2008-2017 *US v OR* Management Agreement, fishery impacts on natural origin fish are managed using a harvest rate schedule based on expected river mouth abundance. There is no escapement goal, but under a run size of 27,000, total inriver harvest rates are less than 5.5%.



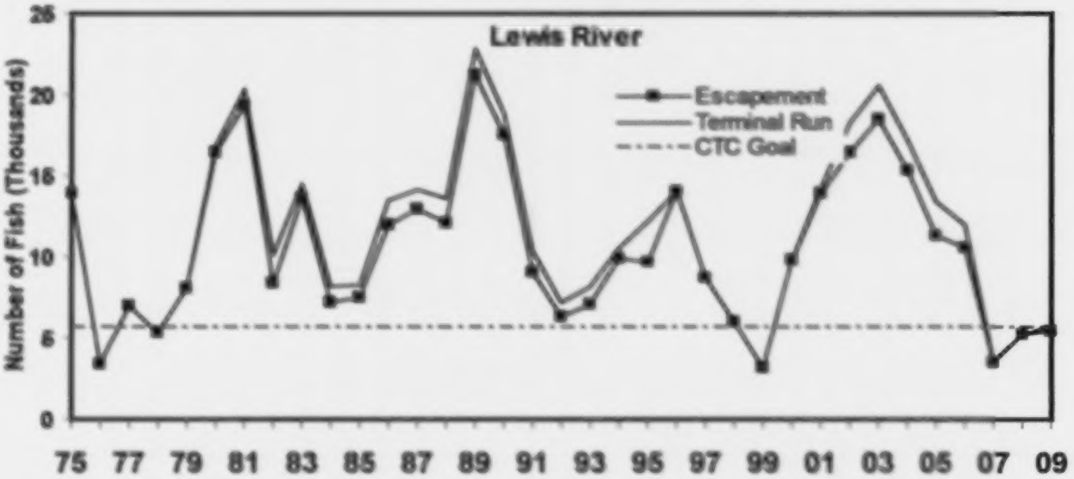
Commentary: The CTC (1999) developed an interim biologically based MSY escapement goal of 17,857 wild upper-Columbia summer Chinook salmon past Bonneville Dam based on PSC Chinook salmon model data. The methods used to reconstruct the escapements for developing the goal were different than the current methods used to estimate upper-Columbia escapements, as presented in Appendix B.5 and graphed above. Hence there is not an escapement goal for these data to be evaluated against. The primary change that occurred for this stock is that run reconstructions are now based on Rock Island dam, rather than Priest Rapids Dam. This changed some of the conversion rates and thus had a ripple effect on run-reconstruction for the entire time series.

Details of the run reconstruction are as follows: 1) Bonneville summer Chinook count minus Zone 6 and upper Columbia catches and incidental mortalities, multiplied by 2) the proportion of the run returning to the Upper Columbia (Priest Rapids dam count as a proportion of the sum of the Priest Rapids and the largest Snake River dam counts), multiplied by the proportion of non-harvested summer Chinook crossing Bonneville that spawned naturally (as calculated by the TAC run reconstruction), and 3) Terminal run is calculated as the Bonneville run plus the catches and incidental mortalities below Bonneville, multiplied by the same two proportions (proportion Columbia and proportion naturally spawning).

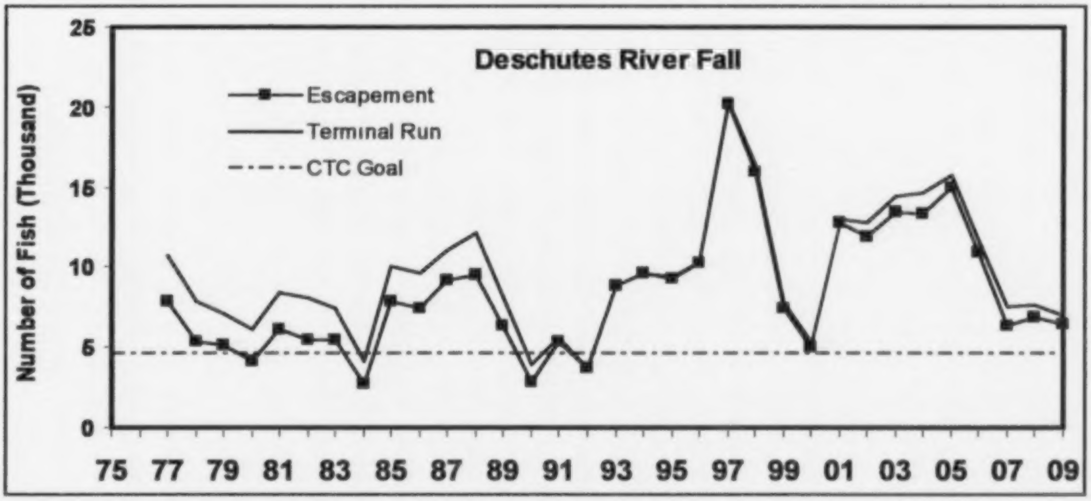
The time series is different than in previous reports because incidental mortality data were compiled and subtracted, as were additional harvests by the Colville and Wanapum tribes. In addition, in the last few reports, hatchery strays spawning naturally were excluded in calculating the proportion natural spawners (for consistency with PFMC reporting of *natural origin* spawners), although they are once again included here, since PSC escapements should include *all naturally spawning fish*. Finally, in 2009, TAC began using counts at Rock Island to calculate summer Chinook conversion rates, rather than Priest Rapids dam counts, so the entire time series of conversion rates have changed. The data prior to 1999 has changed less than data after 1999 in comparison with previous CTC reports. Consequentially, the CTC agreed upon escapement goal is no longer relevant. Under the 2008-2017 *US v OR* Management Agreement, the parties agreed to manage upper Columbia River summer Chinook salmon based on an interim management goal of 29,000 hatchery and natural origin adults as measured at the Columbia River mouth, or 20,000 adults (hatchery and wild) at Bonneville Dam. Escapement statistics reported herein (Appendix Table B.5 and in the figure above) are not relevant to the *US v OR* Management Agreement.



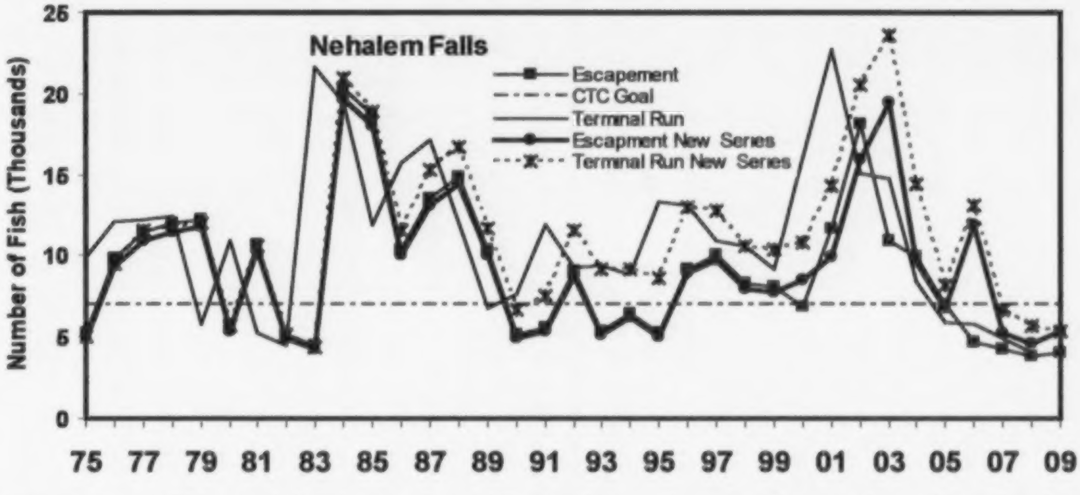
Commentary: The CTC agreed escapement goal for the Columbia River Upriver Bright Chinook salmon is 40,000 naturally spawning fish past McNary dam. The calculation of Upriver Brights starts with the Chinook salmon count at McNary Dam and then subtracts upstream sport fishery harvest and broodstock collections at Priest Rapids, Ringold, and Lyons Ferry hatcheries. This method implicitly combines the non hatchery Snake River, Yakima River, upper Columbia River, and Hanford Reach populations. For purposes of Washington and Oregon ocean fisheries, and in in-river management, the Snake River component is managed separately based on fish counts at the Lower Granite Dam accounting for hatchery production, and Lyons Ferry brood stock separately from the upper Columbia Hanford Reach section that includes the Yakima River brights. The time series differs from the previous reports primarily because the Priest Rapid Hatchery time series on escapement has been updated, and these estimates updated go back for the last 30 years. In addition subsistence catches have also been accounted in the reported estimates. In recent years stocks had large runsizes in 2003 and 2004, with a decline till 2007. It appears that the stocks are on an increasing run-size trend again.



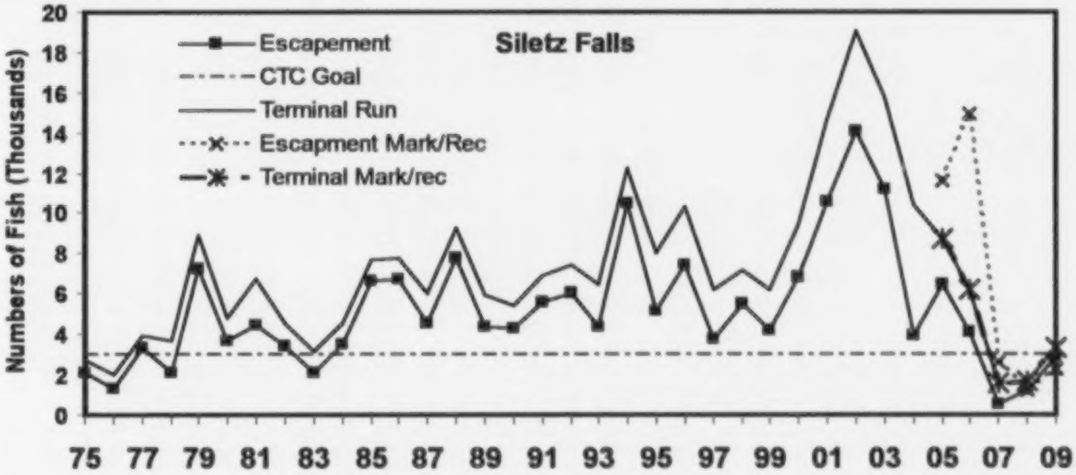
Commentary: The escapement goal for Lewis River fall Chinook salmon is 5,700 naturally spawning fish. Escapement goal were not met for these stocks in 2007, 2008 and 2009. Both ocean and in-river sport fisheries have taken management actions to respond to these declines in productivity and escapement abundance. However, projections for run sizes in 2010 appear to indicate that escapement goals may be met for this stock.



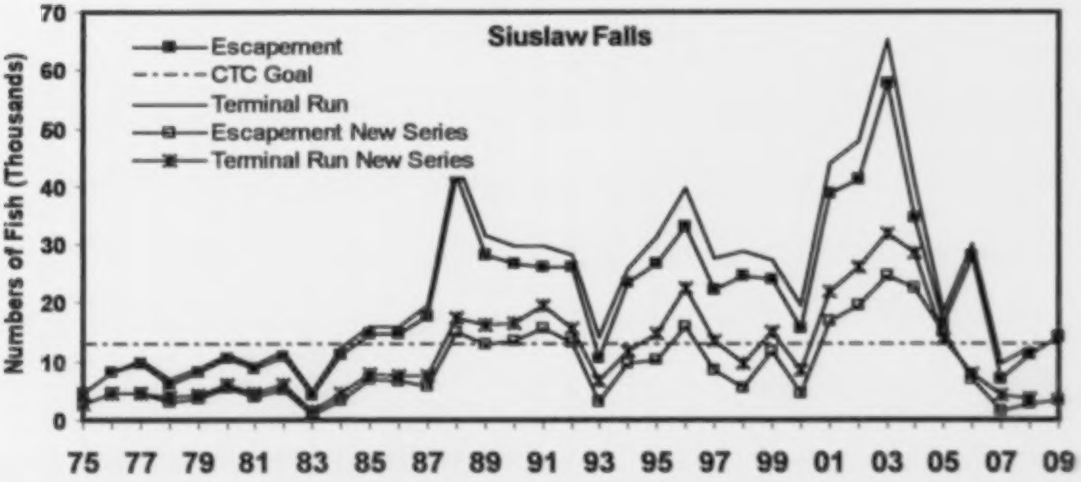
Commentary: The CTC agreed escapement goal for Deschutes River fall Chinook salmon is 4,532 fish. Escapement data are based on a mark-recapture estimate for the area above Sherars Falls, expanded for redd counts below Sherars Falls. From 2000 through 2007, Confederated Tribes of the Warm Springs (CTWS) performed an entire river mark-recapture experiment to validate the Deschutes River fall Chinook salmon escapement estimates based on the Sherars Falls mark-recapture method. Results of these mark recapture estimates confirm the validity of the traditionally derived estimates and have been incorporated into the derivation of the CTC approved escapement goal in this basin. The entire time series of data were updated in this report based on a comprehensive analysis done by Warm Springs, ODFW and CRITFC staff (Sharma et. al. 2010). As such, we are now only reporting the ODFW mark-recapture methods expanded for redds below Sherars falls. For historic years where redd counts were not censused for the entire river, the overall estimate was adjusted (for more details see Sharma et al. 2010).



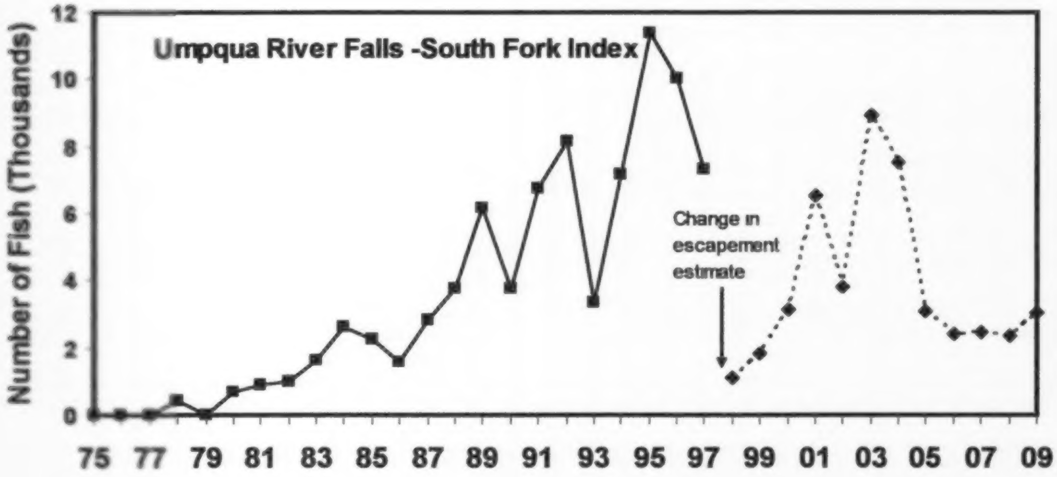
Commentary: This stock has been selected for further study under the auspices of the Sentinel Stock Committee's program to improve escapement estimation. Mark-recapture based adult spawner estimation indicates an escapement of 5,332 Chinook salmon in 2009. Methods directly comparable to those used to generate the agreed to escapement goal for the Nehalem indicate 2009 escapement of 4,070 adult spawners. This is 58% of the current escapement goal. This is the fourth consecutive year of this stock's failure to meet agreed-to escapement goals. Due to continued failures to meet escapement goal, the terminal sport fall Chinook salmon fishery in the Nehalem was closed in 2009. While a terminal sport fishery is being planned for in the 2010 return year, significant area closures, daily and seasonal bag restrictions are being deployed to assist in the rebuilding of this stock. A creel survey program is planned to measure performance of this terminal sport fishery in 2010. The Nehalem is not forecasted to meet the escapement goal in 2010.



Commentary: This stock has been selected for further study under the auspices of the Sentinel Stock Committee's program to improve escapement estimation. Calibration studies have continued through the 2009 spawning year, thus traditional methods of escapement estimation remain in place until the mark-recapture calibration study is complete. Mark-recapture study of escapement in the Siletz resulted in an independent estimate of 2,270 adult spawners in 2009. Estimates on which the escapement goal was derived differ in method, and thus are not directly comparable to mark-recapture based estimates of escapement. The estimate based upon historically produced habitat expansion methods for 2009 was 2,905 adult fall Chinook salmon. This estimate is within 39 fish of the point estimated goal of 2,944 for the basin. Significant terminal area sport fisheries restrictions which included substantial area closures, restrictive daily and seasonal bag limits are believed to have assisted in the performance of this stock to near (or arguably attainment) escapement goal. Both area restrictions and bag limitations are planned to continue to provide a conservative management approach until such time as this stock is believed to be recovered from recent precipitous declines in escapement. This stock is forecasted to exceed the escapement goal in 2010



Commentary: The estimated spawner abundance in 2009 was 3,301adult Chinook salmon. Methods used to generate escapement estimates in this basin are based on five years (2002-2006) of calibrated peak counts on six standard surveys to mark & recapture estimates in the Siuslaw basin. The index value is 0.01054 with a SD of 16%. Escapement goal estimate analysis was based upon available habitat expansion estimates used in other basins on the Oregon coast which have been obviated through the improvement of estimation techniques based upon mark-recapture estimates. Escapement estimates based on methods used to generate the agreed to goal result in an estimated 14,094 adult spawners. This is the first year in the past 3 in which the Siuslaw fall Chinook salmon return has met or exceeded the agreed-to escapement goal in this basin. Spawner-recruit analysis utilizing the updated data set is planned for the near future to compare between newer escapement estimation (backcast through historical data-sets) and an escapement goal based upon the same data. Punch card data used to estimate the recreational sport catch are not yet available for 2009; hence terminal run size estimates from this method are not available for this year. Significant area closures in addition of daily and seasonal bag restrictions are believed to have contributed substantially towards performance of the escapement goal in the Siuslaw basin during the 2009 return year. This stock is forecast to exceed escapement goal in 2010.

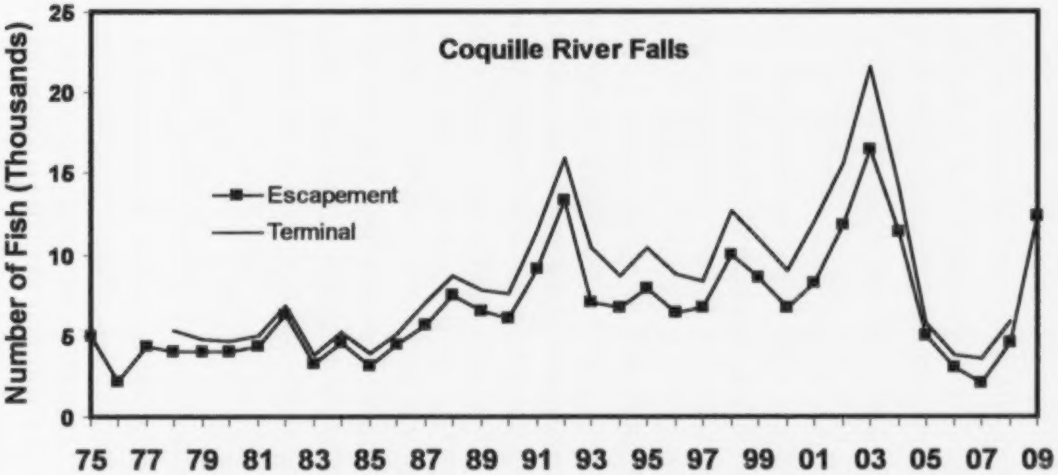


Commentary Coded-wire tagged fall-run Chinook salmon from the Umpqua River have indicated that they are harvested in PSC fisheries. Four years of USCTC funded research has allowed the calibration of the redd counts to derive a fish per redd expansion factor so that annual escapements estimates can be made. The average expansion factor from these studies is 3.69 fish per redd. The coefficient of variation of the expansion factor was found to be 14%, which shows that the average expansion factor is a reliable statistic to use for annual estimates of escapement. The escapement estimate for 2009 was 3,014 based on redd count expansions. Indexes of Chinook salmon spawner abundance in the South Umpqua/Cow creek sub-basin were derived from aerial redd count surveys. The aerial surveys are funded by Douglas County and were conducted twice during the spawning season. Aerial redd counts were conducted on the lower 69 miles of the South Umpqua and the lower 60 miles on Cow Creek. These counts cover all mainstem spawning areas for fall Chinook salmon in the South Umpqua Basin. The South Umpqua is broken up into three reaches (Forks to Happy Valley, Happy Valley to Cow Creek, Cow Creek to Milo) and Cow Creek is considered one reach from the confluence with the Umpqua River to Galesville Dam.

The Coastal Chinook Research and Monitoring project was able to provide a calibration of redds to spawner escapement estimate based on the years 1998 through 2003 excluding 2002 when aerial flights were not conducted. The mean number of fish per redd estimated from these five years was 3.4 with a coefficient of variation of 17.8%

Aerial surveys are conducted using a Bell Ranger 3 helicopter and flights are typically scheduled to encompass the peak spawning period. Two biologists simultaneously count redds for each reach using hand tally-counters. At the end of the reach, each biologists will record the number of redds identified, and counters reset for the next reach. The average of the two observers Chinook salmon redd count from reach will be determined for both flights. The index is defined as the sum of the peak counts for each reach between the two flights. Expansions are sometimes made to account for portions of reaches that were not completed due to visibility or mechanical problems.

Terminal run estimation is currently being conducted and will require some measure of data mining in order to reconstruct what the terminal catch has been historically. Preliminary indications are that the terminal catch of South Fork Umpqua Chinook salmon is insubstantial.



Commentary: Methods of estimation based on Mark-Recapture calibrated analysis indicate an adult Chinook salmon escapement for the Coquille basin of 15,653 spawners. Habitat-expansion based estimates indicate an escapement of 12,308 adult fish. Analysis funded by the CTC is underway that will provide information to designate Coquille Fall Chinook salmon as an escapement indicator stock for the Mid-Oregon Coast (MOC) Aggregate. Calibrated index of peak counts on standard surveys to a relatively precise mark & and recapture abundance estimates has been selected as an efficient and cost effective means to measure spawner escapement of Chinook salmon for use in PST fisheries management.

The U.S. Chinook Technical Committee advises a Coefficient of Variation (CV) of <30% should be achieved in order for an index be used as an estimator of abundance within the Chinook salmon management scheme. The CV between the qualifying calibration values computed from studies conducted from 2001 through 2004 for the Coquille River basin is 14%, and the average index value of 0.00874. This analysis include eight standard survey conducted annually on a regular basis. The calibration value is defined as the average peak count per mile of the eight standard surveys divided by the point value of the Petersen estimate. Peak count is defined as the largest sum of live Chinook salmon and carcasses observed on a particular day, per mile over a defined survey reach.

3 SENTINEL STOCKS PROGRAM

3.1 INTRODUCTION

During recent negotiations within the Pacific Salmon Commission to amend the current Chinook salmon regime under Chapter 3, Annex IV of the Pacific Salmon Treaty, it became apparent that the accuracy and precision of spawning escapement estimates for many important natural stocks of Chinook salmon may not be adequate to support the Treaty management process. Reliable estimates of spawning escapements for a large number of natural Chinook salmon stocks over time are critical to assessing and monitoring the status of the resource throughout the Treaty area, as well as to determining whether adjustments to particular fisheries are necessary and effective for achieving the long term conservation and production goals of the Treaty.

Recognizing the importance of better estimates of Chinook salmon spawning escapements, the Commission conceived the five-year Sentinel Stock Program (SSP) and included it as a specific requirement in the revised Chinook salmon regime (see Paragraph 3(a) of Chapter 3, Annex IV). The SSP is intended to focus on improving spawning escapement estimates for a select subset of important natural Chinook salmon stocks for which existing estimates are critical to fishery management decisions required by the Chinook salmon regime. Improving these estimates will bolster the scientific basis of the Chinook salmon regime, increase confidence in management decisions required under the new regime, and better inform the development of future regimes.

The goal of the Sentinel Stocks Program is to improve estimates of the spawning escapements for each of the included stocks to a level that meets or exceeds bilateral assessment accuracy and precision standards. Nine projects were funded by the SSP in 2009, the first year of the SSP. Summaries for each project are reported in Appendix C.

3.1.1 Oregon

3.1.1.1 Nehalem

The spawning escapement, 4070 (CV = 18%) was estimated using mark-recapture methods. Returning fish were captured by using nets and weirs and then marked with opercular punches. Subsequent carcass surveys were used to recover marked and unmarked fish from the spawning grounds. Since there was no terminal sport fishery in 2009, no creel survey was necessary.

3.1.1.2 Siletz

This mark-recapture program relied on nets and weirs to capture returning fish in the lower river, which were then marked with opercular punches. Carcasses were examined for marks at the spawning grounds. A creel survey was also conducted to estimate removals of marked fish by the terminal sport fishery. The preliminary spawning escapement was estimated at 2,270 Chinook salmon (CV = 13%).

3.1.2 Puget Sound

3.1.2.1 Snohomish

This study attempted to capture and mark live Chinook salmon using beach seines and eddy-set tangle nets and then subsequently recapture them as carcasses on all known spawning grounds or sample them at Sunset Falls, Wallace River Hatchery, and Tokul Creek Hatchery to estimate spawning escapement. Only 31 Chinook salmon were captured and 25 tagged, and only one was physically recaptured at Wallace Hatchery, making an estimate of spawner abundance using mark-recapture statistics impracticable.

3.1.2.2 Skagit

This SSP project was designed to evaluate the feasibility of using a fish trap in the lower Skagit River as a capture and tagging location for a basin-wide mark-recapture study. The fish trap caught zero Chinook salmon and no other fin-fish. The project demonstrated that it was not feasible to use the trap to capture sufficient Chinook salmon for a basin-wide mark-recapture study.

3.1.3 WCVI

3.1.3.1 Kaouk

A floating weir was installed to count fish returning to spawn and to facilitate a mark-recapture study with tag application below the weir and tag recovery above the weir. No fish were caught at the weir due, partially, to severe weather in September and tidal influence at the weir. Further, 13 Chinook salmon were radio tagged, however too few were detected subsequently to estimate spawning escapement using mark-resight methods.

3.1.3.2 Burman

This SSP project estimated spawning escapement (2,363 Chinook salmon; CV = 6%) using mark-recapture methods. Returning fish were captured with beach seines in the lower river and then tagged and released. Carcasses were recovered upstream at the spawning grounds and examined for tags.

3.1.4 Fraser

3.1.4.1 South Thompson River

Spawning escapement to the South Thompson Age 0.3 aggregate was estimated using a combination of genetic, scale age, and CWT information collected from the Northern BC troll fishery and Albion (Fraser River) gillnet test fishery, along with CWT information collected at the Lower Shuswap River. A Bayesian estimation model was used to estimate escapement while considering uncertainty in these information sources. Differences in the spawning escapement estimates based on the Albion (169,000 Chinook salmon; CV = 6%) and Northern BC troll fisheries (155,000 Chinook salmon; CV = 17%) were minor and well within the variation due to sampling variability.

3.1.5 Northern BC

3.1.5.1 Skeena River

Escapement to the Skeena River, 79,838 Chinook salmon (CV = 17%), was estimated from the genetic analysis of representative samples collected at the Tyee test fishery and the spawning abundance in the Kitsumkalum River. The SSP funded the genetic analysis of the test fishery samples in order to identify fish originating from the Kitsumkalum River, which was used to estimate the ratio of fish caught in the test fishery to the spawning grounds for the Kitsumakalum River. The total test fishery catch was expanded by that ratio.

3.1.5.2 Nass River

This SSP project was part of a larger basin-wide escapement program where Chinook salmon were captured and tagged at fishwheels in the lower Nass River and then recovered and examined for marks at upstream tributaries. The SSP funded the operation of a counting fence on the Kwinageese River where 28 marked fish were found among the 895 inspected. This sampling event essentially doubled the total number of tag recoveries for the mark-recapture program and improved the accuracy and precision of the total spawning escapement estimate of 26,864 Chinook salmon (CV = 13%).

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APPENDICES

Appendix A. Landed Chinook salmon catches by region and gear from 1975-2009.

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Appendix A.1. Southeast Alaska (SEAK) Chinook salmon catches.

Year	Southeast Alaska						
	Troll	**Net**	**Sport**	**Total**	**Add-on**	**Terminal Exclusion**	**Treaty Catch**
1975	287,342	13,365	17,000	317,707	-	-	-
1976	231,239	10,523	17,000	258,762	-	-	-
1977	271,735	13,443	17,000	302,178	-	-	-
1978	375,919	25,492	17,000	418,411	-	-	-
1979	337,672	28,388	16,581	382,641	-	-	-
1980	303,643	20,114	20,213	343,970	-	-	-
1981	248,782	18,952	21,300	289,034	-	-	-
1982	241,938	46,992	25,756	314,686	-	-	-
1983	269,821	19,516	22,321	311,658	-	-	-
1984	235,622	32,405	22,050	290,077	-	-	-
1985	215,811	33,870	24,858	274,539	6,246	-	268,293
1986	237,703	22,099	22,551	282,353	11,091	-	271,262
1987	242,562	15,532	24,324	282,418	17,095	-	265,323
1988	231,364	21,788	26,160	279,312	22,525	-	256,787
1989	235,716	24,245	31,071	291,032	21,510	-	269,522
1990	287,939	27,712	51,218	366,869	45,873	-	320,996
1991	264,106	34,864	60,492	359,462	61,476	-	297,986
1992	183,759	32,140	42,892	258,791	36,811	-	221,980
1993	226,866	27,991	49,246	304,103	32,910	-	271,193
1994	186,331	35,654	42,365	264,350	29,185	-	235,165
1995	138,117	47,955	49,667	235,739	58,800	-	176,939
1996	141,452	37,298	57,509	236,259	72,599	8,663	154,997
1997	246,409	25,069	71,524	343,002	46,463	9,843	286,696
1998	192,066	23,514	55,013	270,593	25,021	2,420	243,152
1999	146,219	32,720	72,081	251,020	47,725	4,453	198,842
2000	158,717	41,400	63,173	263,290	74,316	2,481	186,493
2001	153,280	40,163	72,291	265,734	77,287	1,528	186,919
2002	325,308	31,689	69,537	426,534	68,164	1,237	357,133
2003[1]	330,692	39,374	69,370	439,436	57,228	2,056	380,152
2004	354,658	64,038	80,572	499,268	75,955	6,295 1,647	417,019[2] 421,666
2005[3]	338,446	71,618	86,575	496,639	65,294	43,596	387,749
2006[3]	282,315	70,384	85,794	438,493	49,111	30,781	358,601
2007[3]	268,149	55,884	82,848	406,881	69,647	8,815	328,419
2008[3]	151,926	46,149	49,265	247,340	68,163	6,856	172,322
2009	175,644	54,137	69,565	299,346	65,179	4,658	229,509

Troll, net, sport and total catches include catch of SEAK hatchery-origin fish; catches that count towards the all-gear ceiling (with hatchery add-on subtracted) are shown in the "treaty catch" column.

"-" = not applicable.

[1] 2003 values reverted back to original values published in TCCHINOOK05-2.

[2] The value on top excludes District 108 Stikine catch above base levels. The value below includes it.

[3] Values in these years changed due to correction in the accounting of the TBR terminal exclusion.

Appendix A.2. Northern British Columbia (NBC) Chinook salmon catches.

Year	Northern British Columbia						
			Tidal Sport				
	Area 1-5 Troll [1,3]	Area 1-5 Net [3]	Areas 1,2E, 2W	Areas 3-5	Area 1-5 Freshwater Sport	Area 1-5 First Nations	Total
1975	228,121	25,095	NA	NA	NA	4,055	257,271
1976	190,267	16,105	NA	NA	NA	2,791	209,163
1977	130,899	44,196	106	1,670	2,158	6,998	186,027
1978	146,054	27,924	125	1,668	6,610	5,363	187,744
1979	147,576	40,640	0	2,523	1,960	5,266	197,965
1980	157,198	26,895	200	3,867	4,515	10,121	202,796
1981	153,065	41,724	184	2,760	2,613	11,115	211,461
1982	173,472	44,844	215	3,760	2,726	13,255	238,272
1983	162,837	17,134	90	4,092	5,374	15,532	205,059
1984	185,134	31,321	171	2,300	3,426	11,408	233,760
1985	165,845	39,562	600	3,600	3,186	15,794	228,587
1986	175,715	23,902	1,153	3,950	4,410	24,448	233,578
1987	177,457	18,357	2,644	4,150	3,625	16,329	222,562
1988	152,369	31,339	7,059	4,300	3,745	21,727	220,539
1989	207,679	38,623	20,652	4,150	5,247	21,023	297,374
1990	154,109	28,359	16,827	4,300	4,090	27,105	234,790
1991	194,018	40,899	15,047	4,256	4,764	23,441	282,425
1992	142,340	35,716	21,358	6,250	6,182	27,012	238,858
1993	161,686	33,944	25,297	3,279	7,813	21,353	253,372
1994	164,581	22,032	28,973	3,171	3,093	15,949	237,799
1995	56,857	18,076	22,531	2,475	3,503	13,635	117,077
1996	8	33,080	670	3,382	1,250	13,345	51,735
1997	84,385	22,355	27,738	0	NA	14,610	149,088
1998	117,147	7,833	34,130	4,750	NA	20,622	184,482
1999	44,900	11,387	30,227	11,700	NA	27,399	125,613
2000	9,948	22,849	22,100	8,600	NA	23,476	86,973
2001	13,351	25,410	30,400	11,000	NA	23,508	103,669
2002	103,021	15,211	47,100	8,000	NA	14,125	187,457
2003	139,862	15,230	54,300	NA	5,711[2]	20,950	287,454
2004	169,306	12,305	74,000	NA	NA	20,548	276,159
2005	174,806	6,850	68,800	NA	NA	17,553	268,009
2006	151,485	12,561	64,500	NA	NA	17,262	245,808
2007	83,235	10,079	61,000	NA	NA	14,087	168,401
2008	52,147	5,938	43,500	11,970	NA	14,963	128,518
2009	75,470	3,083	34,000	9,177	NA	13,083	134,813

[1] Since 1998, the catch accounting year for troll fisheries was set from October 1-September 30. To make comparisons to previous years more meaningful, the same catch accounting period was applied for years prior to 1998.

[2] Estimate of lower Skeena River sport catch only. Note that Troll (Areas 1-5) and Tidal Sport (Areas 1, 2E, 2W) are the components of the NBC AABM fishery. Net catch excludes jacks and small red-fleshed Chinook salmon.

[3] Troll and Net catches from 1996-2004 have been updated with data from the Catch Finalization Project.

Appendix A.3. Central British Columbia (CBC) Chinook salmon catches.

Year	Central British Columbia					
	Troll [1,3]	**Net [3]**	**Tidal Sport**	**Freshwater Sport**	**First Nations**	**Total**
1975	135,470	40,985	NA	NA	NA	176,455
1976	145,204	32,669	NA	NA	NA	177,873
1977	122,689	32,409	4,773	1,544	6,972	168,387
1978	91,025	35,708	5,694	1,770	7,944	142,141
1979	107,884	50,445	5,225	1,940	7,585	173,079
1980	95,377	27,715	4,802	988	6,240	135,122
1981	69,247	18,912	3,490	1,261	5,701	98,611
1982	69,748	32,419	5,419	1,293	9,112	117,991
1983	97,447	12,556	4,271	821	6,442	121,537
1984	78,120	4,630	4,354	1,332	9,736	98,172
1985	27,090	12,391	3,943	823	6,019	50,266
1986	54,407	23,032	4,566	1,245	6,353	89,603
1987	65,776	10,893	3,933	1,563	6,296	88,461
1988	36,125	12,886	3,596	1,496	6,000	60,103
1989	21,694	6,599	3,438	4,526	8,992	45,249
1990	29,882	18,630	4,053	5,626	9,811	68,002
1991	29,843	15,926	4,409	3,335	8,801	62,314
1992	47,868	18,337	4,891	3,204	8,533	82,833
1993	23,376	10,579	6,114	2,880	9,095	52,044
1994	18,976	14,424	4,303	973	5,383	44,059
1995	5,819	11,007	2,172	1,180	3,501	23,679
1996	0	7,201	2,936	3,986	6,922	21,045
1997	9,274	3,650	8,524	1,139	9,764	32,351
1998	2,188	5,467	5,514	779	6,671	20,619
1999	2,073	4,342	10,300	NA[2]	5,440	22,155
2000	0	3,197	7,400	NA[2]	4,576	15,173
2001	482	6,465	7,650	1,024	5,435	21,056
2002	0	4,676	7,330	723	3,292	16,021
2003	0	2,815	8,385	491	3,173	14,864
2004	0	5,404	10,677	524	4,003	20,608
2005	0	6,323	9,017	809	4,180	20,329
2006	0	5,231	9,400	NA	4,013	18,644
2007	0	5,542	6,130	522	2,102	14,296
2008	9	1,133	2,909	276	3,018	7,345
2009	0	3,132	3,239	0	4,011	10,382

[1] Since 1998, the catch accounting year for troll fisheries was set from October 1-September 30. To make comparisons to previous years more meaningful, the same catch accounting period was applied for years prior to 1998.

[2] freshwater catch included with tidal catch

NA=not available

[3] Troll and Net catches from 1996-2004 have been updated with data from the Catch Finalization Project
Net catch excludes jacks and small red-fleshed Chinook salmon.

Appendix A.4. West Coast Vancouver Island (WCVI) Chinook salmon catches.

Year	West Coast Vancouver Island						
			Tidal Sport	Tidal Sport			
	Troll [1,3,4]	**Net [4]**	**Inside [2]**	**Outside**	**Freshwater Sport**	**First Nations [5]**	**Total**
1975	546,214	19,233	NA	-	NA	NA	565,447
1976	665,010	17,492	NA	-	NA	NA	682,502
1977	545,742	13,745	NA	-	NA	NA	559,487
1978	568,705	25,143	NA	-	NA	NA	593,848
1979	477,222	35,623	7,964	-	NA	NA	520,809
1980	486,303	34,732	8,539	-	NA	NA	529,574
1981	423,266	36,411	11,230	-	NA	NA	470,907
1982	538,510	41,172	17,100	-	NA	NA	596,782
1983	395,636	37,535	28,000	-	NA	NA	461,171
1984	471,294	43,792	44,162	-	NA	NA	559,248
1985	345,937	11,089	21,587	-	NA	NA	378,613
1986	350,227	3,276	13,158	-	NA	NA	366,661
1987	378,931	478	38,283	-	NA	NA	417,692
1988	408,668	15,438	35,820	-	NA	NA	459,926
1989	203,751	40,321	55,239	-	NA	NA	299,311
1990	297,858	29,578	69,723	-	NA	1,199	398,358
1991	203,035	60,797	85,983	-	NA	41,322	391,137
1992	340,146	9,486	46,968	18,518	NA	8,315	423,433
1993	277,033	28,694	65,604	23,312	NA	5,078	399,721
1994	150,039	2,369	52,526	10,313	NA	1,515	216,762
1995	81,454	458	21,675	13,956	NA	5,868	123,411
1996	4	58	2,266	10,229	NA	-	12,557
1997	52,688	5,934	47,355	6,400	NA	5,678	118,055
1998	5,140	345	55,697	4,177	NA	7,172	72,531
1999	7,434	112	47,163	31,106	NA	3,591	89,406
2000	64,547	126	4,468	38,038	NA	-	107,179
2001	79,668	11	6,423	40,179	6,198	-	132,479
2002	126,383	260	36,140	32,115	77	10,785	205,760
2003	146,736	9,251	51,622	23,995	NA	10,000	241,604
2004	171,166	12,348	61,132	42,496	26	16,696	303,864
2005	148,798	23,599	41,710	53,928	6,225	35,000	309,260
2006	109,004	20,308	41,380	37,905	NA	28,628	237,225
2007	94,921	26,881	38,611	46,229	NA	20,098	226,740
2008	95,170	8,257	24,855	50,556	NA	12,159	190,997
2009	58,191	9,765	31,921	66,426	NA	9,026	175,329

Troll: Areas 21, 23-27, and 121-127; Net: Areas 21, and 23-27; Sport: Areas 23a, 23b, 24-27

[1] Since 1998, the catch accounting year for troll fisheries was set from October 1-September 30. The same catch accounting period was applied for years prior to 1998.

[2] Prior to 1992, catch was not reported as 'inside' or 'outside'. Therefore 'inside' catch for those years represents total tidal sport catch.

[3] Including 5,000 First Nations troll catch.

[4] Troll and Net catches from 1996-2004 have been updated with data from the Catch Finalization Project

[5] First Nations catch is mainly commercial catch 1996-2004 has been updated.

Appendix A.5. Johnstone Strait Chinook salmon catches.

Year	Johnstone Strait					
	Troll [1,2]	Net [2]	Tidal Sport	Freshwater Sport	First Nations	Total
1975	18,065	30,295	NA	NA	NA	48,360
1976	30,838	31,855	NA	NA	NA	62,693
1977	26,868	49,511	NA	NA	NA	76,379
1978	13,052	55,148	NA	NA	NA	68,200
1979	13,052	31,291	NA	NA	NA	44,343
1980	11,743	30,325	NA	NA	NA	42,068
1981	13,035	28,620	NA	NA	NA	41,655
1982	11,234	29,454	NA	NA	NA	40,688
1983	14,653	28,364	NA	NA	NA	43,017
1984	9,260	18,361	NA	NA	NA	27,621
1985	3,567	38,073	NA	NA	NA	41,640
1986	3,951	17,866	NA	NA	NA	21,817
1987	1,780	13,863	NA	NA	NA	15,643
1988	1,566	6,292	NA	NA	NA	7,858
1989	1,825	29,486	NA	NA	NA	31,311
1990	2,298	18,433	NA	NA	NA	20,731
1991	1,228	15,071	10,075	NA	1,287	27,661
1992	2,721	9,571	14,715	NA	29	27,036
1993	4,172	15,530	NA	NA	20	19,722
1994	2,231	8,991	NA	NA	0	11,222
1995	4	970	NA	NA	71	1,045
1996	0	472	NA	NA	107	579
1997	1,246	1,018	NA	NA	179	2,443
1998	2,129	328	2,366	NA	138	4,961
1999	273	472	7,813	NA	469	9,027
2000	85	280	5,719	NA	212	6,296
2001	453	332	3,759	NA	370	4,914
2002	129	569	2,331	NA	400	3,429
2003	719	306	7585	NA	130	8,740
2004	316	525	12,837	NA	28	13,706
2005	2	291	12,009	NA	NA	12,302
2006	0	244	7,238	NA	200	7,682
2007	0	2	8,922	NA	200	9,124
2008	0	48	4,370	NA	324	4,102
2009	0	597	10,776	NA	344	11,717

Troll: Area 12 Net: Areas 11-13

Sport: Based on July - August creel census in Area 12 and northern half of Area 13

[1] Since 1998, the catch accounting year for troll fisheries was set from October 1-September 30. The same catch accounting period was applied for years prior to 1998.

[2] Troll and Net catches from 1996-2004 have been updated with data from the Catch Finalization Project.

Appendix A.6. Strait of Georgia Chinook salmon catches.

Year	Georgia Strait				
	Troll [1,3]	Net [2,3]	Tidal Sport	First Nations	Total
1975	174,001		398,000		572,001
1976	200,229		490,000		690,229
1977	248,082		372,000		620,082
1978	217,955		500,000		717,955
1979	255,057		350,000		605,057
1980	273,077		204,100		477,177
1981	239,266		197,239		436,505
1982	179,040		124,390		303,430
1983	105,133		198,433		303,566
1984	90,280		369,445		459,725
1985	55,888		234,838		290,726
1986	44,043		181,896		225,939
1987	38,084		121,081		159,165
1988	20,224		119,117		139,341
1989	28,444		132,846		161,290
1990	34,304		111,914		146,218
1991	32,412		115,523		147,935
1992	37,250		116,581		153,831
1993	33,293		127,576		160,869
1994	12,916		70,839		83,755
1995	138		62,173		62,311
1996	14	8	89,589		89,611
1997	806	1	56,332		57,139
1998	303	11	20,923		21,237
1999	219	0	43,588		43,807
2000	609	0	32,750		33,359
2001	311	3	31,259		31,573
2002	459	16	52,979		53,454
2003	287	18	19,981		20,286
2004	462	0	13,475		13,937
2005	0	20	11,972		11,992
2006	0	0	12,181		12,181
2007	0	0	14,561		14,561
2008	0	0	8,836	4,848	13,684
2009	0	239	17,884		18,123

Troll: Areas 13-18; Net: Areas 14-19; Sport: Areas 13-18, 19a.

[1] Since 1998, the catch accounting year for troll fisheries was set from October 1-September 30. The same catch accounting period was applied for years prior to 1998.

[2] Georgia Strait Chinook salmon net catch is bycatch from non-target fisheries.

[3] Troll and Net catches from 1996-2004 have been updated with data from the Catch Finalization project.

Appendix A.7. Fraser River Chinook salmon catches.

Year	Fraser River Watershed			
	Net [1]	Freshwater Sport [2]	First Nations [3]	Total
1975	66,119	0	20,170	86,289
1976	73,018	0	19,189	92,207
1977	85,222	0	23,310	108,532
1978	50,247	0	19,541	69,788
1979	51,488	0	10,217	61,705
1980	40,061	0	10,528	50,589
1981	22,447	0	8,389	30,836
1982	23,792	96	29,043	52,931
1983	25,580	0	11,875	37,455
1984	27,929	160	17,111	45,200
1985	28,894	596	8,387	37,877
1986	31,401	1,421	12,274	45,096
1987	12,021	3,561	12,050	27,632
1988	8,446	3,702	12,063	24,211
1989	23,443	2,500	4,784	30,727
1990	15,689	2,799	14,180	32,668
1991	14,757	3,116	13,950	31,823
1992	7,363	4,677	10,067	22,107
1993	13,885	3,430	15,395	32,710
1994	13,693	3,195	17,892	34,780
1995	6,451	8,258	17,791	32,500
1996	12,910	7,635	12,665	33,210
1997	40,877	5,051	13,453	59,381
1998	8,292	18,073	14,702	41,067
1999	4,043	8,509	17,999	30,551
2000	8,244	11,727	20,839	40,810
2001	10,398	23,047	18,429	51,874
2002	9,732	24,355	21,796	55,883
2003	11,204	18,014	28,137	57,355
2004	19,224	18,581	31,165	68,970
2005	9,088	22,688	19,832	51,608
2006	7,686	26,662	14,793	49,141
2007	6,795	12,945	13,714	33,454
2008	4,575	18,597	22,417	45,589
2009	6,893	17,468	27,288	51,649

[1] Fraser River Net includes Commercial Area E Gillnet, Test Fisheries, First Nations Economic Opportunities and Scientific Licenses.

[2] Freshwater sport catch includes Fraser mainstem and tributary Chinook salmon catch (adults only).

[3] First Nations Chinook salmon catch includes food, social and ceremonial from the mainstem and tributaries. Economic Opportunity included in commercial net.

Appendix A.8. Canada - Strait of Juan de Fuca Chinook salmon catches.

Year	**Canada - Strait of Juan de Fuca**				
	Net[2]	**Tidal Sport**	**Freshwater Sport**[1]	**First Nations**	**Total**
1975	9,799	NA	NA	NA	9,799
1976	13,004	NA	NA	NA	13,004
1977	25,344	NA	NA	NA	25,344
1978	9,725	NA	NA	NA	9,725
1979	8,665	NA	NA	NA	8,665
1980	3,438	37,900	NA	NA	41,338
1981	9,982	29,832	NA	NA	39,814
1982	7,072	30,646	NA	NA	37,718
1983	328	30,228	NA	NA	30,556
1984	6,237	24,353	NA	NA	30,590
1985	17,164	27,843	NA	NA	45,007
1986	17,727	34,387	NA	NA	52,114
1987	6,782	24,878	NA	NA	31,660
1988	4,473	31,233	NA	NA	35,706
1989	21,238	32,539	NA	NA	53,777
1990	7,405	30,127	NA	42	37,574
1991	8,893	19,017	NA	250	28,160
1992	10,023	21,090	NA	302	31,415
1993	2,287	13,967	NA	317	16,571
1994	8,931	14,372	NA	600	23,903
1995	631	14,405	NA	751	15,787
1996	655	19,012	NA	20	19,687
1997	657	17,080	NA	42	17,779
1998	495	9,709	NA	1,500	11,704
1999	771	14,808	NA	52	15,631
2000	199	10,973	NA	272	11,444
2001	439	23,463	NA	135	24,037
2002	345	24,084	NA	NA	24,429
2003	292	26,630	NA	NA	26,922
2004	187	40,877	NA	NA	41,064
2005	153	30,480	NA	NA	30,633
2006	155	26,437	NA	NA	26,592
2007	138	26,549	NA	NA	26,687
2008	172	22,263	NA	NA	22,435
2009	385	26,387	NA	NA	26,772

Net: Area 20

Sport: Areas 19b and 20

[1] While catch records are poor, in-river sport catch is believed to be small

NA=not available

[2] Net catches from 1996-2004 have been updated with data from the Catch Finalization project.

Appendix A.9. Washington - Strait of Juan de Fuca Chinook salmon catches.

Year	Washington - Strait of Juan de Fuca			
	Troll	**Net**	**Sport**	**Total**
1975	5,752	8,048	81,681	95,481
1976	10,488	6,072	75,308	91,868
1977	8,915	14,930	53,238	77,083
1978	10,006	11,224	62,299	83,529
1979	7,804	10,939	67,094	85,837
1980	10,682	11,320	56,415	78,417
1981	15,638	18,541	51,352	85,531
1982	19,024	22,547	29,842	71,413
1983	18,489	16,141	58,060	92,690
1984	15,650	12,120	48,003	75,773
1985	11,808	12,784	44,267	68,859
1986	30,000	17,000	69,000	116,000
1987	45,000	11,000	53,000	109,000
1988	49,000	10,000	39,000	98,000
1989	65,000	10,000	52,000	127,000
1990	47,162	5,294	50,903	103,359
1991	37,127	3,390	39,667	80,184
1992	31,452	927	38,438	70,817
1993	9,794	1,482	32,434	43,710
1994	3,346	5,864	1,661	10,871
1995	6,397	4,769	6,349	17,515
1996	9,757	604	4,825	15,186
1997	829	492	12,238	13,559
1998	338	265	2,159	2,762
1999	544	589	1,990	3,123
2000	332	640	1,670	2,642
2001	1,974	931	4,819	7,724
2002	1,783	1,076	2,028	4,887
2003	436	908	5,290	6,634
2004	20,627	592	4,519	25,738
2005	5,344	175	2,700	8,219
2006	1,115	957	5,695	7,767
2007	4,329	107	6,967	11,403
2008	1,816	4,579	5,804	12,199
2009	3,280	99	11,940	NA

Troll: Areas 5 and 6C; Area 4B from Jan. 1 - April 30 and Oct. 1 - Dec. 31

Net: Areas 4B, 5, and 6C

Sport: Areas 5 and 6, 4B Neah Bay "add-on" fishery

Appendix A.10. Washington - San Juan Chinook salmon catches.

Year	**Washington - San Juans**			
	Troll	**Net**	**Sport**	**Total**
1975	3	90,100	31,988	122,091
1976	0	66,832	34,505	101,337
1977	62	84,316	14,049	98,427
1978	3	87,565	15,083	102,651
1979	5	53,750	17,367	71,122
1980	0	64,338	12,231	76,569
1981	4	50,695	9,727	60,426
1982	0	38,763	6,953	45,716
1983	2	28,497	15,166	43,665
1984	83	33,432	25,759	59,274
1985	872	33,579	12,610	47,061
1986	0	21,000	15,000	36,000
1987	0	29,000	14,000	43,000
1988	0	32,000	9,000	41,000
1989	1,000	16,000	9,000	26,000
1990	666	8,608	7,370	16,644
1991	135	11,753	5,115	17,003
1992	172	14,011	6,788	20,971
1993	243	14,002	6,916	21,161
1994	73	13,908	5,795	19,776
1995	9	5,333	7,863	13,205
1996	153	3,934	12,674	16,761
1997	29	29,593	9,155	38,777
1998	376	3,804	3,069	7,249
1999	114	3	3,421	3,538
2000	22	1,091	4,447	5,560
2001	0	970	6,522	7,492
2002	0	2,231	4,827	7,058
2003	0	4,827	3,008	7,835
2004	123	5,184	1,971	7,228
2005	0	4,358	2,703	7,061
2006	0	5,278	4,168	9,446
2007	0	2,621	5,524	8,145
2008	0	48	4,020	4,068
2009	0	1,014	3,902	NA

Troll: Areas 6, 6A, 7, and 7A
Net: Areas 6, 6A, 7 and 7A
Sport: Area 7
NA=not available

Appendix A.11. Washington – Other Puget Sound Chinook salmon catches.

Year	Washington – Other Puget Sound		
	Net	Sport	Total
1975	131,982	173,086	305,068
1976	141,281	151,246	292,527
1977	145,470	97,761	243,231
1978	150,298	116,979	267,277
1979	128,073	156,402	284,475
1980	171,516	142,799	314,315
1981	145,152	106,048	251,200
1982	149,274	85,703	234,977
1983	134,492	123,752	258,244
1984	180,248	102,740	282,988
1985	184,907	92,603	277,510
1986	153,000	88,000	241,000
1987	127,000	59,000	186,000
1988	133,000	63,000	196,000
1989	156,000	75,000	231,000
1990	179,593	71,000	250,593
1991	89,495	48,859	138,354
1992	63,460	51,656	115,116
1993	54,968	41,034	96,002
1994	63,577	44,181	107,758
1995	63,593	61,509	125,102
1996	61,658	58,538	120,196
1997	47,522	43,961	91,483
1998	50,915	30,016	80,931
1999	91,947	34,116	126,063
2000	79,494	29,328	108,822
2001	123,266	40,170	163,436
2002	108,566	35,031	143,597
2003	86,206	32,210	118,416
2004	69,211	22,650	91,861
2005	82,629	30,760	108,638
2006	109,557	40,082	149,639
2007	118,628	57,468	176,096
2008	101,322	33,443	134,765
2009	69,150	35,675	NA

Net: Areas 6B, 6D, 7B, 7C, and 7E; Areas 8-13 (including all sub-areas); Areas 74C – 83F
Sport: Areas 8-13 and all Puget Sound Rivers
NA=not available

Appendix A.12. Washington – Inside Coastal Chinook salmon catches.

Year	**Washington – Inside Coastal**		
	Net	**Sport**	**Total**
1975	34,859	1,716	36,575
1976	51,995	2,219	54,214
1977	72,467	2,043	74,510
1978	32,662	3,399	36,061
1979	36,501	2,199	38,700
1980	47,681	1,476	49,157
1981	36,880	786	37,666
1982	33,271	1,114	34,385
1983	16,210	1,452	17,662
1984	16,239	1,319	17,558
1985	25,162	1,955	27,117
1986	29,000	3,000	32,000
1987	51,000	3,000	54,000
1988	74,000	7,000	81,000
1989	85,000	6,000	91,000
1990	57,770	5,000	62,770
1991	54,397	6,070	60,467
1992	64,223	6,577	70,800
1993	59,285	9,180	68,465
1994	46,059	7,454	53,513
1995	46,490	9,881	56,371
1996	55,408	12,059	67,467
1997	28,269	6,619	34,888
1998	20,266	6,569	26,835
1999	11,400	3,165	13,565
2000	15,660	3,179	18,839
2001	19,480	8,645	28,125
2002	23,372	6,038	29,410
2003	18,443	6,075	24,518
2004	21,965	12,088	34,053
2005	20,668	7,051	27,719
2006	27,414	8,030	35,444
2007	12,353	5,066	17,419
2008	15,028	4,006	19,034
2009	18,734	7,609	NA

Net: Areas 2A - 2M; Areas 72B - 73H

Sport: All coastal rivers, Area 2.1, and Area 2.2 (when Area 2 is open)

NA=not available

Appendix A.13. Washington/Oregon North of Cape Falcon Chinook salmon catches.

Year	**Washington/Oregon North of Cape Falcon**			
	Troll	**Net**	**Sport**	**Total**
1975	268,971	1,212	265,785	535,968
1976	371,239	203	215,319	586,761
1977	244,491	4	197,563	442,058
1978	150,673	4	104,306	254,983
1979	133,035	3	84,977	218,015
1980	125,709	1,215	59,099	186,023
1981	109,519	209	96,151	205,879
1982	154,720	267	114,952	269,939
1983	63,584	62	51,789	115,435
1984	15,392	0	6,980	22,372
1985	55,408	493	30,189	86,090
1986	52,000	0	23,000	75,000
1987	81,000	4,000	44,000	129,000
1988	108,000	3,000	19,000	130,000
1989	74,600	1,000	20,900	96,500
1990	65,800	0	32,900	98,700
1991	51,600	0	13,300	64,900
1992	69,000	0	18,900	87,900
1993	55,900	0	13,600	69,500
1994	4,500	0	0	4,500
1995	9,500	0	600	10,100
1996	12,300	0	200	12,500
1997	20,500	0	4,100	24,600
1998	20,615	0	2,292	22,907
1999	44,923	0	10,821	55,744
2000	20,152	0	9,242	29,394
2001	54,163	0	25,592	79,755
2002	106,462	0	60,575	167,037
2003	101,758	0	36,513	138,271
2004	88,225	0	27,090	115,315
2005	87,126	0	40,004	127,130
2006	57,313	0	11,176	68,489
2007	38,742	0	9,535	48,277
2008	35,100	0	15,452	50,552
2009	25,410	0	13,331	38,741

Troll: OR Area 2; WA Areas 1, 2, 3 and 4: Area 4B from May 1 through Sept. 30 (during PFMC management)
Net: WA Areas 1, 2, 3, 4, 4A
Sport: OR Area 2; WA Areas 1, 1.1, 1.2, 2, 3, 4 and 2.2 (when Area 2 is open)

Appendix A.14. Columbia River Chinook salmon catches.

Year	Columbia River[1]			
	Non-treaty net	**Treaty Indian**	**Sport**	**Total**
1975	323,000		34,870	357,870
1976	288,400		42,527	330,927
1977	255,600		58,838	314,438
1978	189,100		56,582	245,682
1979	169,691	7,865	38,700	216,256
1980	113,569	35,604	15,011	164,184
1981	35,881	54,190	21,151	111,222
1982	94,289	65,447	31,236	190,972
1983	32,877	32,490	23,206	88,573
1984	73,481	61,112	43,760	178,353
1985	74,982	79,036	45,444	199,462
1986	168,038	116,777	57,993	342,808
1987	340,931	152,325	105,835	599,092
1988	341,114	163,295	97,638	602,047
1989	146,739	142,765	88,088	377,592
1990	63,602	91,677	79,465	234,744
1991	53,935	58,855	79,260	192,050
1992	24,063	35,072	56,418	115,553
1993	19,929	40,318	64,995	125,241
1994	2,773	36,141	29,634	68,548
1995	777	42,804	36,547	80,128
1996	17,774	67,040	31,875	116,689
1997	11,268	73,569	46,196	131,033
1998	6,464	47,579	34,533	88,576
1999	10,115	80,368	45,500	135,983
2000	21,414	62,979	48,089	132,482
2001	42,137	167,113	136,174	345,424
2002	71,993	166,175	144,060	382,227
2003	77,457	149,204	141,692	368,353
2004	79,141	153,506	144,888	377,535
2005	45,895	128,897	88,349	263,141
2006	45,481	102,802	67,951	216,234
2007	26,761	56,358	51,220	134,339
2008	52,195	138,653	85,412	276,260
2009	71,372	133,736	78,311	283,419

[1] The historical time series of catches in this year's report has changed from previous year's report. Catches after 1980 have been broken out into non-Treaty net and Treaty Indian due to the inability to separate commercial vs. non-commercial. Catches from 1975-1980 are consistent for sport and total with the later times series.

Appendix A.15. Oregon Chinook salmon catches.

Year	Oregon		
	Troll	Sport	Total
1975	300	19,000	19,300
1976	1,000	21,000	22,000
1977	3,000	34,000	37,000
1978	1,000	37,000	38,000
1979	800	31,000	31,800
1980	300	22,000	22,300
1981	300	28,000	28,300
1982	500	23,000	23,500
1983	700	19,000	19,700
1984	1,088	27,000	28,088
1985	1,700	25,000	26,700
1986	1,900	33,000	34,900
1987	3,600	46,000	49,600
1988	4,800	49,000	53,800
1989	4,500	45,000	49,500
1990	0	38,000	38,000
1991	0	44,500	44,500
1992	384	39,000	39,384
1993	649	52,000	52,649
1994	371	33,590	33,961
1995	206	48,366	48,572
1996	989	56,202	57,191
1997	513	37,659	38,172
1998	858	37,990	38,848
1999	1,233	30,735	31,968
2000	1,860	33,262	35,122
2001	1,184	54,988	56,172
2002	1,633	61,085	62,718
2003	1,459	67,939	69,398
2004	2,258	71,726	73,984
2005	1,956	27,866	29,822
2006	1,884	39,357	41,241
2007	1,018	25,684	26,702
2008	208	10,780	10,988
2009	293	NA	NA

Troll: Late season off Elk River mouth.

Sport: Estuary and inland.

NA = not available.

Appendix B. Escapements and terminal runs of PSC Chinook salmon Technical Committee wild Chinook salmon escapement indicator stocks, 1975-2009.

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Appendix B.1. Southeast Alaska and Transboundary river escapements and terminal runs of PSC Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

Southeast Alaska						
Year	Situk [a]		King Salmon	Andrew	Blossom Index	Keta Index
	esc.	t. run	esc.	esc.	esc.	esc.
1975			64	507	146	203
1976	1,421		99	404	68	84
1977	1,732		204	456	112	230
1978	808		87	388	143	392
1979	1,284		134	327	54	426
1980	905	1,925	106	282	89	192
1981	702	1,429	154	536	159	329
1982	434	701	394	672	345	754
1983	592	842	245	366	589	822
1984	1,726	2,367	265	389	508	610
1985	1,521	2,223	175	622	709	624
1986	2,067	2,132	255	1,379	1,278	690
1987	1,379	2,756	196	1,537	1,349	768
1988	868	1,392	208	1,100	384	575
1989	637	1,078	240	1,034	344	1,155
1990	628	926	179	1,295	257	606
1991	889	1,370	134	780	239	272
1992	1,595	3,110	99	1,517	150	217
1993	952	1,871	266	2,067	303	362
1994	1,271	3,128	213	1,115	161	306
1995	4,330	13,608	147	669	217	175
1996	1,800	6,690	292	653	220	297
1997	1,878	5,138	362	571	132	246
1998	924	3,555	134	950	91	180
1999	1,461	5,550	304	1,180	212	276
2000	1,785	4,537	138	1,346	231	300
2001	656	1,807	149	2,055	204	343
2002	1,000	988	155	1,708	224	411
2003	2,117	5,647	119	1,160	203	322
2004	698	2,719	135	2,991	333	376
2005	595	1,059	143	1,979	445	497
2006	695	1,183	150	2,124	339	747
2007	677	929	181	1,736	135	311
2008	413	566	120	981	257	363
2009	902	1,354	109	628	123	172
Goal Lower	450		120	650	250	250
Goal Upper	1,050		240	1,500	500	500

(continued)

Appendix B.1. (Page 2 of 2).

Transboundary Rivers						
Year	Alsek esc.	Taku esc.	Stikine esc.	Unuk esc.	Chickamin Index esc.	Chilkat esc.
1975		12,920	7,571		370	
1976	5,282	24,582	5,723		157	
1977	12,706	29,496	11,445	4,706	363	
1978	12,034	17,124	6,835	5,344	308	
1979	17,354	21,617	12,610	2,783	239	
1980	10,862	39,239	30,573	4,909	445	
1981	8,502	49,559	36,057	3,532	384	
1982	9,475	23,847	40,488	6,528	571	
1983	10,344	9,795	6,424	5,436	599	
1984	7,238	20,778	13,995	8,876	1,102	
1985	6,127	35,916	16,037	5,721	956	
1986	11,069	38,110	14,889	10,273	1,745	
1987	11,141	28,935	24,632	9,533	975	
1988	8,717	44,524	37,554	8,437	786	
1989	10,119	40,329	24,282	5,552	934	
1990	8,609	52,143	22,619	2,856	564	
1991	11,625	51,645	23,206	3,165	487	5,897
1992	5,773	55,889	34,129	4,223	346	5,284
1993	13,855	66,125	58,962	5,160	389	4,472
1994	15,863	48,368	33,094	3,435	388	6,795
1995	24,772	33,805	16,784	3,730	356	3,790
1996	15,922	79,019	28,949	5,639	422	4,920
1997	12,494	114,938	26,996	2,970	272	8,100
1998	6,833	31,039	25,968	4,132	391	3,675
1999	14,597	16,786	19,947	3,914	492	2,271
2000	7,905	36,308	27,531	5,872	801	2,035
2001	6,705	46,664	63,523	10,541	1,010	4,517
2002	5,569	55,044	50,875	6,988	1,013	4,051
2003	5,904	36,435	46,824	5,546	964	5,657
2004	7,083	75,032	48,900	3,963	798	3,422
2005	4,478	38,725	40,501	4,742	924	3,366
2006	2,323	42,296	24,405	5,645	1,330	3,039
2007	2,827	14,854	14,560	5,718	893	1,442
2008	1,860	27,383	18,352	3,109	1,111	2,905
2009	6,095	22,806	11,086	3,157	611	4,429
Goal Lower	3,500	19,000	14,000	1,800	450	1,750
Goal Upper	5,300	36,000	28,000	3,800	900	3,500

[a] A weir is used on the Situk River to estimate escapement. In 2010 a high water event during the peak of the run disabled the weir for 3 days and the 2010 estimate is a partial count

[b] Escapement is germane to fish age 2-ocean and older

Appendix B.2. Canadian escapements and terminal runs of PSC Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

Year	Northern B.C.								
	Area 1 Yakoun	Area 3[1] Nass			Area 4 Skeena		Area 8 Dean	Area 9 Rivers	Area 10 Smith
	esc.	Above GW[1]	Total esc.	t. run	esc.	t. run	Index	Inlet	Inlet
1975	1,500		14,895	17,874	20,319			3,280	960
1976	700		13,819	16,583	13,078			1,640	1,000
1977	800	13,688	14,288	18,410	29,018	39,606		2,225	1,050
1978	600	15,485	16,885	21,807	22,661	35,055	3,500	2,800	2,100
1979	400	11,253	12,783	16,229	18,488	28,166	4,000	2,150	500
1980	600	13,476	14,855	18,744	23,429	38,626	2,000	2,325	1,200
1981	750	12,625	13,925	17,606	24,523	42,018	3,500	3,175	1,020
1982	1,400	7,959	10,359	13,287	17,092	35,185		2,250	1,500
1983	600	13,252	16,301	20,516	23,562	39,510	500	3,320	1,050
1984	300	20,967	24,967	31,408	37,598	53,516	4,500	1,400	770
1985	1,500	17,782	19,694	24,768	53,599	76,544	4,000	3,371	230
1986	500	36,523	38,123	47,967	59,968	87,566	3,300	7,623	532
1987	2,000	19,540	20,986	26,568	59,120	76,349	1,144	5,239	1,050
1988	2,000	15,345	16,715	21,094	68,705	102,563	1,300	4,429	1,050
1989	2,800	28,133	29,175	36,594	57,202	83,439	2,300	3,265	225
1990	2,000	24,051	26,551	33,384	55,976	89,447	2,000	4,039	510
1991	1,900	6,907	8,259	13,136	52,753	79,343	2,400	6,635	500
1992	2,000	16,808	17,408	25,405	63,392	92,184	3,000	7,500	500
1993	1,000	24,814	26,508	36,678	66,977	96,018	700	10,000	500
1994	2,000	21,169	25,689	32,864	48,712	68,127	1,300	3,500	700
1995	1,500	7,844	8,776	16,187	34,390	48,351	1,100	3,196	400
1996	3,000	21,842	22,712	30,889	73,684	96,453	2,000	3,000	250
1997	2,500	18,702	20,584	27,658	42,539	65,350	1,400	4,980	100
1998	3,000	23,213	25,361	34,922	46,744	65,167	3,000	5,367	1,100
1999	3,200	11,544	13,118	22,310	43,775	70,993	1,800	2,739	500
2000	3,600	18,912	20,565	31,159	51,804	77,320	1,200	6,700	500
2001	3,500	29,687	31,915	44,595	81,504	112,346	3,795	5,062	300
2002	3,000	13,773	15,382	21,528	44,771	63,069	3,731	5,031	-[2]
2003	4,000	26,940	28,330	36,503	56,758	82,410	3,700	1,900	-[2]
2004	4,500	15,912	18,185	25,137	44,243	61,065	3,500	3,950	-[2]
2005	5,000	14,363	16,595	24,067	29,067	39,278	2,200	5,585	-[2]
2006	NA	24,725	27,743	37,098	33,094	43,689	3,700	3,930	-[2]
2007	NA	21,459	25,524	34,221	33,352	44,185	2,300	5,000	-[2]
2008	NA	17,862	20,198	26,202	32,963	54,279	1,100	5,792	-[2]
2009	NA	28,710	30,334	36,865	38,297	55,921	1,400	3,750	-[2]

[1] GW refers to Gitwinksihlkw, the location of the lower fish wheels on the Nass River used to capture Chinook salmon for the mark-recapture estimate

[2] The Docee River was dropped as an escapement indicator due to an inability to obtain reliable escapement estimates

Appendix B.2. (Page 2 of 2).

	Southern B.C.				Fraser River						
Year	W. Coast Vancouver Island esc.	Lower Strait of Georgia esc.	Lower Strait of Georgia t. run	Upper Strait of Georgia esc.	Fraser Spring Age 1.2 esc.	Fraser Spring Age 1.3 esc.	Fraser Summer Age 0.3 esc.	Fraser Summer Age 1.3 esc.	Fraser Spr/sum t. run	Harrison esc.	Harrison t. run
1975	800	5,475	6,390		7,179	8,184	26,875	16,875	119,081		
1976	1,075	4,340	5,390		4,600	10,307	4,925	13,630	98,691		
1977	1,835	6,530	7,590	3,880	3,675	13,261	19,600	17,240	132,553		
1978	2,750	6,495	7,035	6,150	4,305	15,725	16,700	19,200	109,119		
1979	2,048	10,686	11,209	4,127	2,770	14,985	18,275	10,205	101,252		
1980	5,974	8,819	10,519	1,367	6,255	16,521	8,350	13,625	71,504		
1981	5,050	6,007	7,607	1,945	2,975	12,274	13,120	12,202	62,668		
1982	6,812	6,186	6,657	3,260	5,510	15,010	6,850	15,088	85,140		
1983	2,700	6,582	6,862	3,770	2,641	24,225	9,500	16,604	72,526		
1984	3,862	8,456	8,861	4,600	6,380	30,370	15,522	13,595	95,681	120,837	131,740
1985	3,700	4,589	5,242	4,600	9,477	43,168	20,375	19,099	121,941	174,778	181,367
1986	2,760	3,105	3,776	1,630	10,275	48,446	22,460	32,505	144,617	162,596	177,662
1987	2,570	3,276	3,781	6,450	5,049	48,271	22,404	27,646	128,699	79,038	81,799
1988	4,560	7,957	8,638	3,300	4,003	41,783	29,567	32,066	129,587	35,116	38,285
1989	6,220	7,087	8,142	5,550	6,126	31,994	24,200	16,200	106,843	74,685	76,294
1990	3,660	7,023	7,627	2,320	3,225	41,560	25,425	33,747	135,124	177,375	180,837
1991	5,060	8,343	8,613	3,340	3,495	27,296	26,250	28,097	116,555	90,638	93,363
1992	4,830	11,377	11,637	5,268	5,937	33,038	32,200	38,011	130,249	130,411	132,042
1993	4,530	8,435	8,730	1,574	7,870	32,796	13,300	21,385	110,237	118,998	120,600
1994	4,080	7,479	7,824	1,237	10,696	51,655	25,350	23,657	145,303	98,334	100,839
1995	3,710	18,749	19,282	4,227	9,670	45,237	20,550	26,371	134,478	28,616	29,840
1996	6,026	16,465	17,275	3,600	20,726	38,398	50,900	43,142	185,559	37,394	38,568
1997	7,197	11,745	11,936	5,266	9,878	44,373	49,250	40,882	202,795	70,514	72,061
1998	11,643	7,658	8,731	10,350	3,003	37,862	68,033	36,750	169,333	188,425	189,103
1999	10,186	8,481	8,714	9,500	8,751	20,740	53,204	25,138	140,939	107,016	107,884
2000	4,675	8,084	8,223	12,850	11,731	26,773	45,161	25,869	155,209	77,035	78,098
2001	2,737	7,463	8,569	9,885	10,607	31,512	74,132	33,980	177,008	73,134	74,419
2002	4,036	5,862	7,812	12,865	16,423	42,408	85,132	34,886	221,020	89,968	91,122
2003	4,456	5,028	5,903	13,978	17,137	45,441	70,164	44,451	231,689	247,121	251,453
2004	8,491	3,271	3,641	13,365	12,156	31,614	53,764	30,980	194,440	128,990	138,890
2005	3,969	3,503	4,870	13,365	3,898	21,458	88,329	18,586	172,281	86,730	92,993
2006	4,568	3,910	4,880	961	6,642	21,699	149,928	20,565	242,878	50,942	52,798
2007	3,839	4,442	4,778	639	1,407	11,737	85,722	10,536	137,206	79,176	83,445
2008	3,342	4,686	4,926	520	6,121	17,181	106,539	15,431	187,591	41,603	43,798
2009	7,197	2,041	2,966	798	911	24,150	86,443	20,619	172,858	70,141	75,550
Goal LL										75,100	
Goal UL										98,500	

Appendix B.3. Puget Sound escapements and terminal runs of PSC Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

Year	Puget Sound													
	Skagit Spring		Skagit Sum/fall		Stillaguamish		Snohomish		Green		Nooksack Spring esc.		Lake Washington Fall	
	esc.	t. run	esc.	t. run	esc.	t. run	esc.	t. run	esc.	t. run	N. Fork	S. Fork	esc.	t. run
1975	627	627	11,320	24,625	1,198	1,635	4,485	6,123	3,394	6,238			656	881
1976	633	633	14,120	23,306	2,140	4,002	5,315	9,889	3,140	7,732			719	759
1977	520	520	9,218	17,994	1,475	2,549	5,565	9,618	3,804	5,366			675	728
1978	932	932	13,075	20,030	1,232	1,959	7,931	12,591	3,304	4,349			890	1,202
1979	818	818	13,306	21,443	1,042	2,366	5,903	12,706	9,704	10,730			1,289	1,430
1980	1,408	1,408	20,058	28,938	821	2,647	6460	16,688	7743	10,608			1360	1,431
1981	1,045	1,045	8,283	19,675	630	2,783	3368	8,968	3606	4,912			721	792
1982	753	753	9,910	20,722	773	3,058	4379	8,470	1840	3,850			885	1,148
1983	554	554	8,723	14,671	387	925	4549	10,386	3679	13,290			1332	2,124
1984	696	696	12,628	15,005	374	883	3762	8,480	3353	5,381	45	188	1252	3,436
1985	2,634	2,634	16,002	25,075	1,223	2,455	4,873	9,005	2,908	7,444	258	445	949	2,305
1986	1,922	1,922	17,908	21,585	1,277	2,416	4,534	8,267	4,792	5,784	226	170	1,470	2,419
1987	1,745	1,745	9,409	13,037	1,321	1,906	4,689	6,670	10,338	11,724	181	248	2,038	4,124
1988	1,743	1,743	11,468	14,647	726	1,185	4,513	7,389	7,994	9,207	456	233	792	2,373
1989	1,400	1,809	6,684	12,787	811	1,642	3,138	6,142	11,512	15,000	303	606	1,011	1,688
1990	1,511	1,546	16,792	19,172	842	1,739	4,209	8,345	7,035	15,200	10	142	787	1,128
1991	1,236	1,273	5,824	8,423	1,632	2,913	2,783	4,964	10,548	14,967	108	365	661	1,415
1992	986	1,010	7,348	9,201	780	1,247	2,708	4,319	5,267	9,941	498	103	790	1,349
1993	782	812	5,801	6,879	928	1,299	3,866	5,602	2,476	5,202	449	235	245	304
1994	470	496	5,656	6,586	954	1,285	3,626	4,885	4,078	7,963	45	118	888	891
1995	855	887	6,985	9,209	822	920	3,176	5,000	7,939	9,743	230	290	930	944
1996	1,051	1,078	10,706	12,286	1,244	1,244	4,851	7,921	6,026	8,668	534	203	336	341
1997	1,041	1,064	4,951	6,134	1,156	1,167	4,292	4,334	11,800	12,097	520	180	294	296
1998	1,086	1,091	14,700	14,976	1,540	1,558	6,304	6,344	9,115	10,627	368	157	697	697
1999	471	476	5,002	5,249	1,098	1,101	4,799	4,817	13,173	14,595	823	166	778	778
2000	1,021	1,025	17,024	17,206	1,647	1,647	6,092	8,400	10,526	16,222	1,245	284	347	347
2001	1,856	1,866	13,868	14,081	1,312	1,351	8,164	8,395	21,402	24,594	2,209	267	1,269	1,516
2002	1,076	1,092	19,671	19,887	1,636	1,641	7,220	7,245	14,857	16,460	3,741	289	637	647
2003	909	987	9,964	10,946	1,067	1,095	6,211	6,364	10,405	12,765	2,857	204	771	800
2004	1,622	1,622	23,750	24,241	1,506	1,531	10,606	10,780	13,991	20,631	1,746	130	730	773
2005	1,305	1,305	20,803	23,396	963	991	4,484	4,611	4,089	4,708	2,167	120	726	786
2006	1,896	1,919	20,819	21,196	1,254	1,268	8,308	8,402	10,157	14,141	1,184	355	1,219	1,245
2007	613	613	11,291	12,390	785	789	3,982	4,000	7,186	11,225	1,438	182	1,734	2,561
2008	1,472	1,472	11,351	14,470	1,800	1,801	8,373	8,378	5,971	10,109	1,266	318	758	1,334
2009	983	983	6,955	12,161	1,001	1,001	2,262	2,262	688		1,903	294	713	

Appendix B.4. Washington Coast escapements and terminal runs of PSC Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

Year	Washington Coast																	
	Quillayute Summer		Quillayute Fall		Hoh Spr/Sum		Hoh Fall		Hoko Fall		Queets Spr/Sum		Queets Fall		Grays Harbor Spring		Grays Harbor Fall	
	esc.	t. run	esc.	t. run	esc.	t. run	esc.	t. run	esc.	t. run	esc.	t. run	esc.	t. run	esc.	t. run	esc.	t. run
1976	1,300	1,700			600	1,300	2,500	3,100			505	737	1,200	2,500	600	1,000	1,836	5,852
1977	3,800	5,300			1,000	2,000	2,100	3,800			732	1,155	3,600	5,500	800	1,700	5,195	8,386
1978	2,300	2,700			1,400	2,472	1,900	2,900			1,110	1,406	2,200	3,100	1,000	1,600	4,555	6,319
1979	2,100	3,900			1,400	2,326	1,700	2,200			870	1,369	3,900	4,700	400	1,100	9,381	9,769
1980	964	1,500	6,700	7,600	800	1,079	2,200	2,800			1,038	1,213	3,200	5,800	200	600	11,656	16,467
1981	815	1,700	5,963	7,102	1,498	2,005	3,100	4,000			988	1,329	4,250	8,200	600	900	7,577	9,681
1982	1,126	2,700	7,107	9,651	1,553	2,125	4,500	5,800			781	1,244	4,150	6,600	610	669	5,606	9,217
1983	548	1,800	3,069	5,530	1,696	2,233	2,500	3,300			1,044	1,173	2,750	4,400	800	850	5,482	7,623
1984	618	1,000	9,128	10,447	1,430	2,005	1,900	2,600			958	1,189	4,350	6,300	1,128	1,130	21,058	22,758
1985	550	700	6,145	8,367	978	1,353	1,725	2,720			677	886	4,150	5,910	1,157	1,159	9,537	13,066
1986	853	1,000	10,006	13,380	1,248	1,912	4,981	6,000	801	839	925	1,193	7,894	9,180	1,795	1,826	13,951	23,313
1987	666	1,600	12,352	20,349	1,710	2,480	4,006	6,147	581	606	598	1,543	6,557	10,638	841	1,071	19,023	34,043
1988	2,599	3,943	15,168	22,115	2,605	3,708	4,128	6,873	784	821	1,765	2,267	9,494	12,505	3,106	3,208	27,216	39,603
1989	2,407	3,472	9,951	17,260	4,697	6,820	5,148	8,682	845	862	2,568	3,954	9,324	12,213	2,068	2,393	25,599	55,394
1990	1,483	1,840	13,711	16,914	3,886	5,294	4,236	6,327	493	498	1,780	2,480	10,569	13,155	1,567	1,630	16,580	38,976
1991	1,188	1,500	6,292	7,631	1,078	1,693	1,420	2,628	1,008	1,024	630	761	4,795	6,593	1,289	1,489	13,432	33,080
1992	1,009	1,271	6,342	7,750	1,018	1,443	4,003	5,139	741	750	375	505	4,911	6,880	1,813	1,851	13,175	32,962
1993	1,292	1,531	5,254	5,735	1,411	2,065	2,280	3,951	894	908	713	788	3,463	5,667	1,254	1,399	11,844	30,114
1994	974	1,187	4,932	5,692	1,699	2,372	3,967	4,322	429	440	705	727	4,233	6,854	1,403	1,479	11,817	30,989
1995	1,333	1,731	5,532	6,716	1,132	1,686	2,202	2,912	929	949	625	662	3,127	5,101	2,070	2,167	9,952	31,900
1996	1,170	1,388	7,316	9,293	1,371	2,083	3,022	4,061	1,256	1,258	776	891	4,218	5,927	4,462	4,745	16,988	34,357
1997	890	1,177	5,405	6,047	1,826	2,582	1,773	3,034	868	888	540	693	2,872	4,945	4,460	4,844	16,342	31,083
1998	1,599	1,829	6,752	7,940	1,287	1,880	4,257	5,388	1,702	1,702	492	537	3,859	5,173	2,388	2,679	11,476	20,711
1999	713	818	3,334	4,758	928	1,081	1,924	2,941	1,550	1,550	373	426	1,918	3,105	1,285	1,551	9,196	13,314
2000	989	1,149	3,730	4,794	492	529	1,749	2,632	730	730	248	250	3,755	4,147	3,135	3,417	8,081	15,178
2001	1,225	1,399	5,136	7,545	1,159	1,231	2,560	4,116	838	838	548	565	2,321	3,604	2,860	3,326	8,340	19,079
2002	1,002	1,100	6,067	9,512	2,464	3,375	4,415	5,716	680	680	738	755	2,097	4,377	2,598	3,217	10,621	16,570
2003	1,219	1,308	7,398	9,469	1,228	1,646	1,649	2,319	1,098	1,098	189	195	4,120	5,203	1,904	2,103	17,808	22,842
2004	1,093	1,159	3,831	6,133	1,786	2,239	3,237	4,410	1,088	1,088	604	619	3,576	4,778	5,034	5,330	29,461	43,360
2005	876	1,033	6,406	8,319	1,193	1,389	4,180	5,316	284	284	298	306	3,076	4,521	2,130	2,683	17,040	23,682
2006	553	604	5,642	7,656	904	1,061	1,632	2,088	880	880	330	336	2,340	3,255	2,481	2,863	15,955	24,367
2007	536	568	3,066	4,137	810	1,023	1,559	2,427	568	568	352	358	709	1,293	652	916	11,264	17,060
2008	949	1,036	3,612	5,250	671	717	2,849	3,761	483	483	305	305	2,568	3,465	996	1,281	13,570	17,868
2009	555	681	3,083	5,494	880	913	2,081	2,613	385	385	495	495	2,909	4,061	1,123	1,348	7,166	13,145
Goal			3,000		900		1,200				700		2,500					

Appendix B.5. Columbia River escapements and terminal runs of PSC CTC wild Chinook salmon escapement indicator stocks.

Year	Columbia Upriver Spring		Columbia Upriver Summers /1						Lewis River /2		Deschutes		Brights /3	
			Mid-Columbia		Snake River		Total							
	esc.	t.run	esc.[5]	t.run	esc.	t.run	esc.	t.run	esc.	t.run	esc.	t.run	esc.	trun.
1975									13,859	13,859			29,600	163,855
1976									3,371	3,371			27,700	109,097
1977									6,930	6,930	7,903	10,658	36,060	85,336
1978									5,363	5,363	5,393	7,908	25,798	77,936
1979	31,381	32,636	16,355	17,238	2,714	2,609	19,069	19,846	8,023	8,023	5,126	7,124	28,926	82,482
1980	32,983	34,090	16,583	17,494	2,688	2,919	19,271	20,413	16,394	16,856	4,106	6,127	27,708	70,743
1981	35,069	36,959	11,569	12,484	3,306	4,385	14,875	16,869	19,297	20,298	6,070	8,411	19,520	58,693
1982	39,930	42,933	8,077	8,958	4,210	4,645	12,287	13,603	8,370	10,126	5513[6]	8,113	28,313	71,471
1983	31,946	33,355	7,455	7,682	3,895	4,430	11,350	12,112	13,540	14,489	5,491	7,372	45,567	79,113
1984	25,339	27,210	12,213	12,533	5,429	5,016	17,642	17,549	7,132	8,128	2,779[6]	4,165	52,266	127,651
1985	32,263	33,450	12,277	13,258	5,062	3,884	17,339	17,142	7,491	8,241	7,902	10,053	74,206	187,691
1986	40,764	43,329	10,313	11,034	6,154	5,657	16,467	16,691	11,983	13,504	7,467	9,606	93,051	272,949
1987	35,312	37,620	13,240	14,400	5,891	7,200	19,131	21,601	12,935	14,173	9,187[6]	11,031	126,153	409,412
1988	32,629	35,108	12,102	13,010	6,145	8,112	18,247	21,122	12,059	13,636	9,548	12,165	98,220	327,976
1989	32,517	35,230	17,230	17,326	3,169	3,397	20,399	20,724	21,199	22,813	6,338	8,144	83,281	253,233
1990	30,901	33,204	12,983	13,072	5,093	5,123	18,076	18,195	17,506	18,784	2,864	3,887	49,020	149,759
1991	20,471	21,843	9,593	9,715	3,809	3,510	13,402	13,225	9,066	10,354	5,373	5,561	40,132	97,758
1992	34,030	36,248	6,013	6,073	3,014	3,007	9,027	9,080	6,307	7,129	3,668	3,698	41,434	77,311
1993	30,213	32,187	8,514	8,779	7,889	4,287	16,403	13,066	7,025	8,106	8,809	8,817	42,515	94,088
1994	9,289	9,780	11,635	11,812	795	890	12,430	12,702	9,939	10,541	9,556	9,598	66,645	123,214
1995	4,812	5,062	9,063	9,391	692	831	9,755	10,222	9,718	12,155	9,304	9,338	50,595	97,119
1996	19,484	20,562	7,524	7,793	2,607	2,772	10,131	10,565	13,971	13,971	10,233	10,308	53,049	132,882
1997	17,920	19,212	8,464	8,602	10,709	7,536	19,173	16,138	8,670	8,670	20,208	20,337	50,215	141,386
1998	17,452	18,393	9,337	9,549	4,355	4,739	13,692	14,288	5,929	5,929	15,908	16,383	42,113	125,888
1999	11,170	11,710	16,042	16,382	3,260	3,437	19,302	19,819	3,184	3,184	7,389	7,707	43,313	158,044
2000	51,918	55,287	15,033	16,340	3,933	3,919	18,966	20,259	9,820	9,820	4,985	5,321	60,988	150,352
2001	96,017	110,633	32,238	37,610	13,735	14,097	45,973	51,707	13,886	14,186	12,817	13 033	84,652	222,630
2002	50,836	57,029	60,194	68,721	22,159	19,376	82,353	88,097	16,380	18,230	11,907	12,727	116,858	265,166
2003	53,315	57,934	53,562	64,742	16,422	16,606	69,984	81,348	18,505	20,505	13,413	14,384	161,136	357,848
2004	56,953	62,465	36,164	49,909	8,813	10,230	44,977	60,139	15,342	17,133	13,297[4]	14,674	149,529	356,437
2005	31,728	33,871	35,533	48,759	6,736	7,602	42,269	56,361	11,348	13,348	14,937	15,735	111,721	258,554
2006	27,832	29,818	34,842	59,158	7,058	12,387	41,900	71,545	10,522	11,999	10,955	11,659	76,722	215,424
2007	14,368	15,443	14,152	22,944	7,309	10,075	21,461	33,019	3,468	3,606	6,361	7,583	45,652	99,444
2008	25,077	29,003	17,691	26,268	22,612	22,784	40,303	49,052	5,200	5,200	6,908	7,614	74,386	189,681
2009	30,054	32,496	20,031	32,297	14,482	17,541	34,513	49,838	5,410	5,760	6,429	7,013	85,759	205,035
Goal			17,857						5,700		4,532		40,000	

1/ Under the 2008 CRFMP, Upper Columbia Summer Chinook salmon are managed for a combined hatchery and natural tributary spawning escapement of 20,000 Snake River spring/summer Chinook salmon are managed separately

2/ This is the number of naturally spawning adult fish in the Lewis River The terminal run given is the escapement plus the Lewis River sport catch of wild adults

3/ In 2002, the escapement goal of 40,000 was agreed to by the CTC The 2008-2017 US v OR Management Agreement includes a minimum management goal of 60,000 adults for Columbia River and Snake River upriver brights combined, including both hatchery and natural production for all areas above McNary Dam The new agreement also includes 43,500 as the minimum Upriver Bright adult escapement, including Priest Rapids broodstock The escapements listed are the McNary Dam count, minus Hanford sport and broodstock The terminal run is the Columbia River mouth terminal run of Upriver Brights minus the Deschutes River fall Chinook salmon terminal run

4/ 2004 escapement data updated by ODFW

5/ The time series for escapement has been completely changed as run reconstruction methods were improved and reconstructed fro the entire time series

6/ Escapement was estimated for these years for the entire river using the methods shown in Sharma et al (2010) This was primarily done as there were no lower river redd-surveys conducted for these years and the Mark recapture method above Sherars needed to be expanded for the entire river

Appendix B.6. Oregon Coastal escapements as estimated via traditional habitat expansion methods and terminal runs of PSC Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

Year	Oregon							
	Nehalem		**Siletz**		**Siuslaw**		**Coquille**	
	esc.	**t. run**	**esc.**	**t. run**	**esc.**	**t. run**	**esc.**	**t. run**
1975	5,197	5,303	2,062	2,689	4,427	4,548	4,927	NA
1976	9,807	9,908	1,326	2,036	7,999	8,153	2,188	NA
1977	11,478	12,093	3,314	3,919	9,492	10,362	4,379	NA
1978	12,059	12,244	2,062	3,700	5,872	6,879	3,951	5,290
1979	12,205	12,469	7,217	8,907	8,040	8,799	4,030	4,715
1980	5,555	5,832	3,680	4,820	10,630	11,183	4,014	4,622
1981	10,752	10,939	4,435	6,751	8,724	9,342	4,313	4,996
1982	5,085	5,282	3,415	4,514	10,870	11,774	6,249	6,865
1983	4,431	4,525	2,136	3,152	4,186	4,885	3,193	3,807
1984	20,341	21,623	3,461	4,552	11,168	12,437	4,502	5,164
1985	18,670	19,473	6,628	7,685	14,822	15,805	3,157	3,853
1986	10,389	11,920	6,748	7,799	14,844	15,965	4,470	5,125
1987	13,560	15,725	4,577	6,023	17,603	19,411	5,640	6,997
1988	14,889	17,185	7,805	9,257	41,746	44,380	7,451	8,635
1989	10,389	12,000	4,401	5,980	28,279	31,690	6,462	7,820
1990	5,104	6,789	4,313	5,373	26,799	29,593	6,064	7,567
1991	5,557	7,685	5,633	6,926	26,100	29,825	9,074	11,470
1992	9,060	11,863	6,044	7,460	26,090	28,350	13,293	15,911
1993	5,345	9,317	4,342	6,506	10,446	14,012	6,993	10,419
1994	6,486	9,412	10,475	12,188	23,570	25,890	6,698	8,696
1995	5,194	8,845	5,164	8,045	26,715	31,194	7,885	10,374
1996	9,211	13,285	7,394	10,274	33,051	39,705	6,346	8,790
1997	10,026	13,069	3,726	6,165	22,305	27,516	6,743	8,338
1998	8,245	10,869	5,516	7,175	24,708	28,882	9,930	12,680
1999	8,063	10,632	4,166	6,232	23,963	27,271	8,513	10,950
2000	6,855	9,119	6,787	9,462	15,730	19,588	6,684	8,974
2001	11,662	15,998	10,563	14,704	38,717	43,836	8,233	12,007
2002	18,089	22,657	14,054	19,019	41,058	47,905	11,848	15,578
2003	10,906	15,095	11,149	15,693	57,795	65,044	16,482	21,572
2004	9,975	14,792	3,902	10,419	34,427	40,456	11,346	14,041
2005	7,038	8,459	6,426	8,727	16,619	18,303	5,029	5,767
2006	4,711	5,902	4,108	6,194	28,082	29,926	3,009	3,790
2007	4,304	5,759	528	1,536	6,764	9,665	2,098	3,557
2008	3,810	4,865	1,202	1,682	11,119	12,405	4,562	5,813
2009	4,070	4,070	2,905	3,343	14,094	NA	12,308	NA
Goal	6,989		2,944		12,925		pending	

Appendix B.7. Oregon Coastal escapements and terminal runs as estimated by mark-recapture calibrated indexes of PSC Chinook Technical Committee wild Chinook salmon escapement indicator stocks.

	OREGON						
Year	**Nehalem**		**Suislaw**		**Umpqua S. Fork**	**Coquille**	
	esc.	**t. run**	**esc.**	**t. run**	**esc.**[1]	**Esc.**	**t. run**
1975	4,954	5,060	2,567	2,567	NA	6,668	NA
1976	9,345	9,446	4,565	4,565	NA	2,766	NA
1977	10,937	11,552	4,531	4,531	NA	5,676	NA
1978	11,491	11,676	2,867	3,874	400	5,618	6,957
1979	11,794	12,058	3,554	4,313	NA	5,203	5,888
1980	5,368	5,645	5,483	6,036	697	5,952	6,560
1981	10,390	10,577	3,767	4,385	890	6,405	7,088
1982	4,914	5,111	5,094	5,998	1,011	8,885	9,501
1983	4,282	4,376	923	1,622	1,628	4,686	5,300
1984	19,657	20,939	3,384	4,653	2,594	6,229	6,891
1985	18,042	18,845	6,845	7,828	2,246	4,498	5,194
1986	10,039	11,570	6,513	7,634	1,573	5,642	6,297
1987	13,103	15,268	5,568	7,376	2,795	6,429	7,786
1988	14,388	16,684	14,935	17,569	3,778	8,389	9,573
1989	10,039	11,650	12,856	16,267	6,162	6,948	8,306
1990	4,932	6,617	13,662	16,456	3,761	7,738	9,241
1991	5,370	7,498	15,709	19,434	6,717	10,508	12,904
1992	8,755	11,558	13,221	15,481	8,149	16,636	19,254
1993	5,165	9,137	2,960	6,526	3,364	7,446	10,872
1994	6,268	9,194	9,477	11,797	7,128	6,866	8,864
1995	5,020	8,671	10,246	14,725	11,388	12,060	14,549
1996	8,901	12,975	15,788	22,442	10,019	7,618	10,062
1997	9,689	12,732	8,313	13,524	7,286	8,580	10,175
1998	7,967	10,591	5,456	9,630	1,104	11,877	14,627
1999	7,792	10,361	11,785	15,093	1,804	10,653	13,090
2000	8,553	10,817	4,648	8,506	3,140	7,880	10,170
2001	9,957	14,293	16,814	21,933	6,510	12,512	16,286
2002	15,984	20,552	19,400	26,247	3,831	13,675	17,405
2003	19,380	23,569	24,596	31,845	8,918	18,876	23,966
2004	9,639	14,456	22,596	28,625	7,487	11,668	14,363
2005	6,801	8,222	14,884	13,800	3,084	5,438	6,176
2006	11,938	13,129	6,965	7,696	2,396	7,438	8,219
2007	5,193	6,648	1,491	4,154	2,457	2,098	4,037
2008	4,596	5,651	2,617	3,484	2,333	5,803	7,661
2009	5,332	5,332	3,301	NA	3,014	15,653	NA
Goal	pending		pending		pending	pending	

1/Preliminary analysis has shown that terminal catch of S Fork Umpqua fall Chinook salmon is unsubstantial

Appendix C. Sentinel Stocks Program in 2009.

The Sentinel Stocks Committee (SSC) met in Seattle during March 2009 to review and recommend projects for funding under the Sentinel Stocks Program (SSP). Fourteen proposals were reviewed and 10 were recommended for funding in 2009. The Pacific Salmon Commission approved funding for nine of the ten proposals. The proposals were chosen as per the approach outlined in the directive from the Commission to the SSC entitled *Implementation Approach for the Chinook Sentinel Stocks Program, October, 2008* and the *Sentinel Stocks Program Second Stage Proposal Evaluation, February, 2009*. Recommended proposals represent stocks in all five regions specified in the directive (North Oregon Coast, Puget Sound, Fraser River, west coast of Vancouver Island, and northern British Columbia). The sentinel stocks recommended for study are of significant importance to the management of fisheries for Chinook salmon under the Pacific Salmon Treaty. Funded projects and requested budget amounts are summarized in Appendix Table C-1. Summaries of results from these funded projects are provided in the narratives below

Appendix Table C-1. Projects and funding levels for the Sentinel Stocks Program in 2009.

Stock Group	Stock	Title	2009 Funding Level ($1000s)
Oregon Coast	Nehalem	Nehalem River Escapement Enumeration	$269,400 US
Oregon Coast	Siletz	Siletz River Escapement Enumeration	$252,000 US
Puget Sound	Snohomish	Abundance Estimate for Snohomish System	$220,600 US
Puget Sound	Skagit	Feasibility of Capturing Chinook Salmon	$46,400 US
WCVI	Kaouk	Kaouk River Escapement Estimation	$321,800 CAN
WCVI	Burman	Burman River Escapement Estimation	$142,600 CAN
Fraser	S. Thompson	Abundance Estimates South Thompson Aggregate	$101,500 CAN
NBC	Skeena	Escapement Estimation Skeena River w/ GSI	$29,300 CAN
NBC	Nass	Estimate of Aggregate Population Upper Nass	$63,200 CAN

Nehalem & Siletz Chinook Salmon Escapement Assessments

The Siletz and Nehalem populations of fall Chinook salmon are part of the Northern Oregon Coast (NOC) aggregate. The Nehalem basin is located at the far north of the NOC aggregate, while the Siletz basin is located approximately mid-section within the NOC aggregate of stocks. The NOC stock aggregate is considered one of five "driver stocks" in Aggregate Abundance Based Management (AABM) fisheries and is of high importance in both AABM and Individual Stock Based Management (ISBM) fisheries. The NOC aggregate has historically been a highly productive and resilient stock complex. However recent failures to reach escapement goals in all three indicator stocks within the aggregate have prompted greater interest in quantifying the performance of this group. The 1995 to 2004 adult spawning escapement average in the Siletz River was 7,242 Chinook salmon. In the Nehalem River, the 1999 to 2008 adult spawning escapement average was 8,541 Chinook salmon.

Methods to Estimate Escapement

In both basins, spawning escapement was estimated using standard mark-recapture methods. Adult fish were captured upon return to each basin using nets and weirs. Fish were marked using operculum punches, the location of which was varied to represent different time frames of freshwater entry. The second capture event(s) occurred on the spawning grounds. Pre-selected reaches were surveyed by foot or by boat and live fish, carcasses, and redds were counted. A creel survey was conducted in the Siletz basin. No creel survey was conducted in the Nehalem as the fishery was closed under emergency rule.

Comparison to Historic Estimates

Historically, spawner escapement in Oregon coastal basins was derived using habitat-expansion methodology. Standard spawning ground surveys were conducted to record live and dead Chinook salmon counts. A peak count (largest daily sum of live and dead counts for a given survey location) was identified, and an index calculated (fish per mile). The index was expanded to total estimated available spawning habitat in each basin. Additional functions were used to adjust for observation and non-random bias. Department personnel have calculated estimates using these traditional methods while concurrently conducting mark-recapture experiments in the Siletz basin since 2005 and in the Nehalem basin from 2000 to 2003 and in 2009 (Appendix Table C-2).

Results Summary

A total of 235 adult Chinook salmon were marked in the Siletz River basin during the 2009 return year. A total of 465 adult carcasses were recovered on the spawning grounds; 46 of which were marked (>19% recovery rate). The percentile method was used to calculate the 95% confidence intervals from a 1,000 bootstrap samples. The interval lies between the 25th lowest value and 25th highest value of bootstrap population estimates. Chi square tests indicated a significant temporal bias with the mark - recapture experiment, thus the pooled Peterson technique was compared to a stratified Darroch estimate (2,744) for an assessment of accuracy. The pooled Petersen is presented as an estimate of abundance, but further analysis may be warranted to determine which estimator may be best suited for use in the calibration analysis. The total escapement to the spawning ground was estimated to be 2,270 adult Chinook salmon, with a coefficient of variation (CV) of 13%. This CV is within the CTC standard of 15%.

In the Nehalem River basin for 2009, a total of 326 adult Chinook salmon were marked using four unique placements of operculum punches. A total of 546 qualifying carcasses were examined on the spawning grounds. Thirty-nine were marked for a mark recovery rate of almost 12%. Given the low number of returns per stratum, low level of precision of the stratified estimator, and relative similarity of the stratified and pooled Peterson estimates (within 95% CI of pooled estimator), the pooled Petersen estimator was selected to estimate the population size. The pooled Petersen estimate for the Nehalem basin was 5,332 adult fish with a CV of 17.7%. The CV is slightly higher than the CTC standard of 15%. This may be due to the fact that this was a new system for many staff and new survey areas and techniques were under investigation. It is anticipated that the CV in future years will decline as personnel become more familiar with the basin and sampling techniques improve with experience.

Calibration or Expansion Factors

Given future and current constraints around personnel and funding resources; this research has focused on identifying a spawning ground survey protocol using peak counts as the index to track fall Chinook salmon spawner abundance. Previous studies in the Siuslaw and Salmon Rivers correlating various survey indices to a mark-recapture derived escapement estimate, suggest that peak counts performed as the most consistent indicator of abundance when compared to other visual indices. Standard surveys located in the Siuslaw basin differ from those in these basins, in that all fall within the larger, mainstem habitat type, while all of the Siletz and some of the Nehalem standard surveys are located in smaller tributary habitats.

During low water years or during low abundance returns, the smaller tributary habitats are often not used and exhibit high spawner density variability.

Preliminary analysis of the potential standard surveys located on the mainstem Nehalem and the Siletz River basins have been conducted. Values presented as "calibration value" are defined as the "count" value divided by the Petersen mark-recapture estimate. The ideal conversion factor value would have an inter-annual CV of 0, if it tracks perfectly with changes in spawner abundance (Appendix Table C-3). Variability in the inter-annual CV is likely underestimated as this descriptive statistic does not incorporate the precision of the population estimate used, nor does it incorporate the variability within the survey index.

Future Escapement Estimates

The agency's intent is to identify a cost-effective spawning ground survey design where one or more of the measured metrics accurately and relatively precisely represent Chinook salmon spawner abundance for the basin. The current focus is to increase the proportion of mainstem habitat surveyed from previous years to increase the probability of identifying survey reaches where fish counts will consistently track the spawner estimate derived through the mark-recapture component of this study, regardless of run strength or water levels. The ODFW intends to survey these select mainstem or large tributary reaches annually throughout the duration of these studies. This analysis will require multiple years of statistically sound mark-recapture experiments before a complete assessment of survey results can be performed with an acceptable level of uncertainty.

Appendix Table C-2. Comparisons of Chinook salmon spawner escapement estimates between traditional, habitat expansion methods and mark and recapture techniques with associated coefficient of variation (CV)

	Siletz River Basin				Nehalem River Basin			
Year	Index (fish/mile)	Traditional	Mark-recapture	CV	Index (fish/mile)	Traditional	Mark-recapture	CV
2000	49	6,787	NA	NA	51	6,855	10,678	26%
2001	77	10,563	NA	NA	85	11,662	12,431	12%
2002	102	14,054	NA	NA	98	18,089	19,956	5%
2003	81	11,149	NA	NA	77	10,906	24,196	22%
2004	28	3,902	NA	NA	64	9,975	NA	NA
2005	53	6,426	11,592	47%	45	7,038	NA	NA
2006	49	4,108	14,953*	16%	30	4,711	NA	NA
2007	5	528	2,625	16%	27	4,304	NA	NA
2008	10	1,203	1,202	20%	24	3,810	NA	NA
2009	24	2,905	2,270*	13%	27	4,070	5,332	18%

**Additional analyses required to assess the influence of potential biases on the accuracy of the estimate.*

Appendix Table C-3. Calibration of adult (>600mm) Chinook salmon encountered on standard surveys to mark-recapture estimates in the Siletz and Nehalem River basins. CV values represents the variation around the annual calibration values beginning at year three.

	Siletz River Basin				Nehalem River Basin			
Year	Peak Count per Mile	Calibration Value	Mark-Recapture Estimate	Calibration CV (%)	Peak Count per Mile	Calibration Value	Mark-Recapture Estimate	Calibration CV (%)
2000	49	NA	NA	NA	51	0.00478	10,678	—
2001	77	NA	NA	NA	85	0.00684	12,431	—
2002	102	NA	NA	NA	98	0.00491	19,956	20.94%
2003	81	NA	NA	NA	77	0.00318	24,196	30.37%
2004	28	NA	NA	NA	64	NA	NA	NA
2005	53	0.00457	11,592	—	45	NA	NA	NA
2006	49	0.00290	14,953	—	30	NA	NA	NA
2007	5	0.00175	2,625	46.10%	27	NA	NA	NA
2008	10	0.00798	1,202	63.09%	24	NA	NA	NA
2009	24	0.01066	2,270	66.18%	27	0.00506	5,332	22.92%

Snohomish Chinook Salmon Escapement Assessment

Spawner abundance of certain spring, summer, and fall Chinook salmon stocks in Puget Sound, including those in the Snohomish River system, have historically been estimated from counts of redds. Additionally, adult salmon abundances in the Snohomish Basin estimated at Sunset Falls, the Wallace River Hatchery, and the Tokul Creek Trout Hatchery, have been added to the estimated natural spawners to yield basin total spawner escapement.

This study attempted to capture and mark live Chinook salmon in the Snohomish River Basin using beach seines and eddy-set tangle nets, and to subsequently recapture them as carcasses on all known spawning grounds or sample them at Sunset Falls, Wallace River Hatchery, and Tokul Creek Hatchery to generate a statistically defensible spawner escapement estimate. Each fish was marked with two uniquely coded tags: an external Floy dart tag and an injected Passive Integrated Transponder (PIT) tag. Though initial plans also included oral insertion of a radio telemetry tag into a subset of fish, sample size was so low that every fish received a radio tag. In total, only 31 Chinook salmon were captured and 25 fish were tagged. Only one was physically recaptured at Wallace Hatchery, making an estimate of spawner abundance using mark-recapture statistics impracticable. Radio telemetry data showed that fish dispersed throughout the Snohomish basin from the tagging site on the mainstem Snohomish River and that movement was correlated with flow pulses. Although sample size was small, fish moved as individuals rather than groups and were never observed to hold in the same hole concurrently. Several non-adipose fin marked fish spawned in close proximity to the Wallace River Hatchery.

Skagit River Chinook Salmon Capture Feasibility Assessment

The principle investigators did not submit an executive summary as specified and requested by the SSC and the CTC. Based upon information provided to the SSC in December 2009, no Chinook salmon were caught in the fish trap built and fished in the Skagit River.

Kaouk Chinook Salmon Escapement Assessment

The WCVI Chinook salmon stock aggregate consists of production primarily from 27 spawning streams that are represented by six escapement indicator index streams identified in Attachments IV of the PST: Marble River (Area 27), Tahsish, Artlish, Kaouk (Area 25), Tahsis, and Burman Rivers (Area 25); and an eleven stream index including additional streams to those in Attachments IV. WCVI Chinook salmon are far north migrating and assumed ocean distributions are similar to the Robertson Creek Hatchery (RCH) Chinook salmon indicator stock. RCH coded wire tagged Chinook salmon are regularly recovered from sampling in the SEAK, NBC and WCVI AABM fisheries and from Central Coast and WCVI ISBM fisheries. Kaouk River Chinook salmon are not exposed to directed ISBM terminal commercial net, First Nations Economic Opportunity freshwater net fisheries (Canada Net), nor directed sport fisheries in the terminal area as are the RCH stock in Barkley Sound, so relative exploitation rates in the seaward fisheries are likely somewhat different than is the case for RCH Chinook salmon. No historic age data are available to assess maturation rates or other biological characteristics of the spawning population.

A floating weir was built with a concrete fishway and an aluminum trap box to enumerate and sample escaping adult Chinook salmon. A secondary mark-recapture study was also planned using 60 radio tagged Chinook salmon. Due to severe weather in the month of September and the tidal influence at the weir site, Chinook salmon were not counted through the weir. The weir was topped a total of three times. An escapement estimate based on weir counts was not possible. The bulk of Chinook salmon passed over the weir during the September 18th flood event, based on a swim survey conducted on the 24th. Since a weir based estimate was not produced, calculating an expansion factor was not possible. Therefore the only escapement estimate produced was based upon the normative swim based area-under-the-curve

(AUC) methodology. The AUC estimate for 2009 was 550 Chinook salmon, which is above the 15-year average. Assessments from past escapement programs based on AUC estimates have resulted in annual escapement estimates that ranged from as low as 110 fish in 2000 to a high of 820 fish in 1998 with a 15-year average (1995-2008)of 380 fish.

Burman Chinook Salmon Escapement Assessment

The WCVI fall Chinook salmon stock aggregate is an important production group contributing to catches of Chinook salmon in Alaskan and Canadian Aggregate Abundance-Based Management fisheries and Canadian Individual Stock-Based Management fisheries. The stock group includes four Conservation Units, described under the Canadian Wild Salmon Policy, occupying the west coast of Vancouver Island (WCVI), British Columbia. Burman River Chinook salmon belong to the Nootka-Kyuquot Conservation Unit. The Burman River Chinook salmon population is an escapement indicator population described in the PST Chinook Attachments I-IV. Escapements to the Burman River are summed along with the estimated escapements to five other streams to produce a six-stream index representing WCVI escapement trends. The Burman escapement estimate is also summed in a second larger index that includes eight additional WCVI streams. Exploitation of the aggregate is assumed to be represented by the Robertson Creek Hatchery Coded-Wire Tag exploitation rate indicator stock. Low stock status in the stock group has prompted fishing restrictions in Canadian fisheries since 1995. More recently, conservation concerns for the WCVI stock group and other southern stocks prompted a 15% reduction in the Chinook salmon catch levels in southeast Alaskan fisheries as negotiated in the recent Pacific Salmon Treaty. Over the prior 10 year period (1999-2008), escapements to the Burman River averaged 841 adult Chinook salmon based upon area under-the-curve swim survey methodology.

Attempts to estimate Chinook salmon escapement with three separate 2-event mark-recapture experiments aimed at age-3 and older Chinook salmon were made. The abundance of Chinook salmon that returned in 2009 to the Burman River was estimated with an unconventional 2-event Petersen mark-recapture experiment: marking and recaptures of fish occurred concurrently over the spawning period. Chinook salmon were captured and marked using a beach seine in the lower river staging area below the counting sections; by beach seine and tangle net in river counting sections; and, by recovering carcasses. Biological samples and marks were also recovered from two hatchery brood collections. All Chinook salmon captured, with the exception of fish released unmarked during the hatchery brood collections, were marked with two individually numbered #3 Kurl-lock tags attached to the opercula and a secondary mutilation mark. Fish were identified by gender, and post-orbital hypural length was measured. Scales were collected for ageing and otoliths were recovered from carcasses and hatchery brood collections to determine origin.

A total of 375 adult Chinook salmon (163 females and 212 males) were marked in the lower river. A total of 740 live adults (327 females and 368 males) were subsequently captured in the same location of which 149 (72 females and 77 males) were marked. The resulting pooled Petersen estimate of ≥ age-3 and older Chinook salmon (> 500 mm) was 2,363 fish (SE = 136.9, CV = 5.8%). The CV of the estimate met the data standard of 15%. The stratified estimates of abundance were 1,444 (SE = 119.5, CV = 8.3%) > age=3 males and 933 (SE = 70.8, CV = 7.9%) females. The estimate for age-2 males (≤500mm) was 375 (SE = 89.8, CV = 23.9%) derived by marking 58 and recapturing 10 with marks among a catch of 69. Statistical tests for selectivity indicated the lower river samples were unbiased, and with the exception of a single age sample could be pooled. Bootstrapping with 1,000 samples of the mark-recapture data indicated a positive statistical bias of 2.4%. The 95% confidence interval sample was 1,450 - 2,930 fish. Selectivity bias for gender and size were identified in the carcass survey data and near size bias was indicated in the live river recaptures where recapture rates were less than downstream.

The ratio of males to females was 1.23:1.00. The age structure for age-3 and older Chinook salmon was 32.3 % age-3 fish, 31.2 % age-4 fish, 33.3% age-5 fish, and 2.3% age-6 fish. Age-3 males were the most abundant component in the return followed by age-5 fish that were largely females. Origin proportions estimated from thermal otolith marks indicated that 0.0707 (SE = 0.0153) were naturally spawned and the remainder originated from hatcheries: 0.6396 (SE = 0.0286) of the total were from the Burman River hatchery program; and, 0.2898 (SE = 0.0270) had strayed from other hatcheries in the region.

The normal area-under-the curve index (AUC_{index}) swim survey estimate for 2009 was 1,801 > age-3 fish. The expansion factor between the AUC_{index} estimate and the mark-recapture estimate was 1.31. The AUC_{index} estimate was within the 95% confidence interval of the mark-recapture estimate. Hatchery brood collections removed 209 Chinook salmon that are included in the AUC_{index} abundance estimate.

South Thompson Chinook Salmon Escapement Assessment

A Bayesian model was developed to estimate the escapement of an aggregate salmon stock based on Genetic Stock Identification data and recoveries of coded wire tags (CWTs) from a hatchery indicator stock in distant fisheries and on the spawning grounds. The model was applied to data from 2009 for the South Thompson Age 0.3 Chinook Aggregate, a significant component of the Fraser early model stock used by the CTC. The expected escapements for the South Thompson aggregate, based on data from the Fraser River gillnet test fishery (Albion) and NBC troll fishery were 169,000 (CV=0.06) and 155,000 (CV = 0.17), respectively. Differences in the two estimates were minor and well within variation due to sampling error. Age-specific estimates of escapement were relatively precise in cases where the uncertainty in the expanded number of CWT recoveries in the fisheries was low. The model was not able to reliably estimate escapement for age-5 fish, as no CWTs were recovered in either fishery. Increasing the number of CWT recoveries is essential to reduce uncertainty in age-specific escapement estimates. In support of this process CWT releases to the Lower Shuswap River indicator in 2009 were increased from 200,000 to 250,000 and to the Middle Shuswap River from zero to 150,000.

The Fraser River Chinook salmon Summer-Run Age 0.3 aggregate stock is a major contributor to ocean fisheries in Southeast Alaska (SEAK) and Northern British Columbia (NBC). Since 2002, this stock represented upwards of 30-40% of the NBC troll fishery catches. Good quality spawning ground estimates for this stock group are needed to develop accurate forecasts of the NBC and SEAK abundance indices to define allowable catch. However, the current visual survey methods are thought to underestimate spawner numbers because of poor counting conditions experienced during helicopter surveys in the South and lower Thompson rivers. Results from the Lower and Middle Shuswap escapement survey calibration programs indicate escapements can be underestimated by 20-65% in the Fraser Summer-run Age 0.3 aggregate.

The Sentinel Stocks program provided $101,500 CAN for this project in 2009 with the majority of funds directed to the increased tagging of hatchery releases in the South Thompson Aggregate and to the costs associated with increased sampling effort in the Lower Shuswap River mark-recapture program. The PST's Northern Endowment Fund contributed to the majority of the model development work with additional Sentinel Stock funds used to optimize it for the South Thompson aged 0.3 aggregate.

Skeena Chinook Salmon Escapement Assessment

The number of Chinook salmon returning to the Skeena River in 2009 was estimated using the proportion of Kitsumkalum River fish measured from genetic samples collected at Tyee and the estimate of the Kitsumkalum Chinook salmon escapement from an independent mark-recapture project. The Skeena

River has the third largest aggregate of Chinook salmon spawning populations in British Columbia and is one of the escapement indicator stocks defined by the Pacific Salmon Treaty for North/Central British Columbia. Chinook salmon escapements to the Skeena River are represented by an index that includes approximately 20 populations surveyed annually using a variety of techniques. The Kitsumkalum River is the exploitation rate indicator stock for the Skeena Chinook salmon complex and spawning escapements have been estimated using a mark-recapture program since 1984. Fish counting weirs are present on the Babine, Sustut and Kitwanga Rivers but the Babine weir only counts part of the Babine population and the Sustut and Kitwanga populations are relatively small. Other escapement estimates that contribute to the index are based on visual observations from helicopter, fixed wing aircraft, boats and foot surveys. The index of Chinook salmon escapement to the Skeena aggregate has averaged 50,000 fish since 1984 (Appendix Table C-4). The Kitsumkalum indicator stock represents approximately 30% of the spawners in the escapement index. The Bear and Morice River populations have contributed 20% and 26% of the escapement index respectively since 1984.

Appendix Table C-4. Skeena Chinook salmon escapement index 1984 to 2009.

Year	Skeena Escapement Index	Year	Skeena Escapement Index
1984	35,864	1997	42,539
1985	52,407	1998	46,774
1986	59,719	1999	43,775
1987	60,948	2000	51,804
1988	68,307	2001	81,504
1989	57,192	2002	44,771
1990	55,541	2003	56,758
1991	52,792	2004	39,552
1992	67,118	2005	29,496
1993	68,286	2006	36,682
1994	22,611	2007	37,054
1995	34,390	2008	34,615
1996	73,684	2009	38,597

Skeena Chinook salmon are encountered in the PST Aggregate Abundance Based Management (AABM) fisheries in Southeast Alaska (SEAK all gear) and Northern British Columbia (NBC Troll and Haida Gwaii (QCI) Sport). They also contribute to the Individual Stock Based Management (ISBM) fisheries in Northern British Columbia including gillnet, tidal sport, non-tidal sport, tidal First Nations' (FN) and non-tidal FN fisheries. Skeena Chinook salmon are north migrating so they do not contribute to the West Coast Vancouver Island (WCVI) AABM fisheries nor do they contribute appreciably to ISBM fisheries south of the Skeena River.

The preliminary estimate of large Chinook salmon returning to the Skeena River in 2009 as measured at Tyee was 79,838 fish with a standard deviation of 13,601 fish (coefficient of variation = 17%). The proportion of Kitsumkalum fish in samples of 1,155 Chinook salmon caught at Tyee was 13.4% with a standard deviation of 1.4%. The escapement of large Chinook salmon to the Kitsumkalum River was estimated from an independent mark-recapture estimate at 10,703 fish with a standard deviation of 1,424 fish.

The 2009 data were compared with genetic analyses completed for Chinook salmon samples collected at Tyee in 2000, 2001 and 2003 (Appendix Table C-5). Preliminary estimates for the Chinook salmon return to the Skeena River had coefficients of variation between 15.2% and 17.2%. Improvements were expected in 2009 as the sample sizes were increased at Tyee and the genetic baselines were improved. However, these improvements were not realized due to broader variance around the 2009 mark-recapture estimate of Kitsumkalum River Chinook salmon escapement.

Appendix Table C-5: Skeena Chinook salmon escapement past Tyee from the proportion of Kitsumkalum Chinook salmon identified in the Tyee Test Fishery compared with the index.

Year	Kalum Esc Mark-Recapture	CV Kalum Esc	No Tyee DNA	% Kalum in Tyee DNA	CV Kalum in Tyee DNA	Total Skeena Esc from DNA	CV Skeena Esc Est	Skeena Esc Index
2000	14,722	8.2%	775	15.6%	12.8%	94,668	15.2%	51,804
2001	23,839	9.5%	569	19.7%	12.9%	120,803	16.1%	81,504
2003	23,608	11.0%	468	22.3%	13.2%	105,857	17.2%	56,758
2009	10,703	13.3%	1155	13.4%	10.6%	79,838	17.0%	38,597

Kalum = Kitsumkalum, No. = sample size, CV = coefficient of variation, Esc. = escapement, and Est. = estimate.

An objective for the project was to provide an escapement estimate for Skeena River Chinook salmon with a CV of less than 15%. While the project failed to meet these criteria in 2009, the preliminary estimates represent an improvement over existing indices since it provides an estimate of variance. Variance estimates cannot be produced for the escapement indices of Skeena Chinook salmon because of the combination of different escapement techniques involved. Accurate determination of spawning escapements will require estimates of fishery removals upstream of Tyee and stock identification for fisheries between Tyee and the Kitsumkalum River to determine if Kitsumkalum fish suffer different fishing mortalities than other Skeena components.

The Sentinel Stocks program provided $29,300 CAN for this project in 2009. This represented relatively frugal funding to estimate the Chinook salmon return to the Skeena River aggregate. The results are preliminary and will be revised after improvements to the Skeena genetic baselines are incorporated.

Nass Chinook Salmon Escapement Assessment

The Upper Nass River Chinook Aggregate salmon stock forms one of the existing CTC wild Chinook salmon indicator stocks. This is a large stock group that has averaged 22,000 spawners per annum (44,000 total run) over the last decade and includes 16 separate populations including the Tseax River and all other populations that spawn within the Nass watershed upstream of the confluence of the Nass and the Tseax River. The Upper Nass River Chinook salmon Aggregate is important relative to the overall coast-wide Chinook salmon resource. It represents a very stable proportion of the Chinook salmon stocks taken in northern BC and Alaskan fisheries. Upper Nass River Chinook salmon stocks contribute to the Aggregate Abundance Based Management (AABM) fisheries in Southeast Alaska (all gear types), Queen Charlotte Island recreational, tidal gill net, tidal sport, tidal First Nations, freshwater sport, and freshwater First Nation fisheries in Northern British Columbia. The Upper Nass River Chinook salmon Aggregate is a completely natural population with no history of enhancement and likely very little, if any, straying from other enhanced systems such as from the Kincolith or Kitsumkalum rivers.

Since 1994, mark recapture estimates of the Upper Nass River Chinook salmon Aggregate have been derived by marking Chinook salmon with operculum tags at fishwheels on the mainstem Nass River near the Nisga'a village of Gitwinksihlkw and recovering/examining live Chinook salmon for marks at the Meziadin fishway and Chinook salmon carcasses at other Upper Nass River tributary locations. Carcass recovery locations have varied over the years but have been predominantly conducted in the Damdochax and Kwinageese rivers. Effort has been focused on these two systems as they were found to be significantly contributing stocks to the Upper Nass River Chinook salmon Aggregate population (~30%) based on stock composition results from radio-telemetry studies conducted in 1992 and 1993. Carcass recoveries have also been attempted on other systems such as Cranberry, Snowbank, Tiegen, and Oweegee; but these have not resulted in adequate recoveries (i.e., < 5 tags recovered) for generating reliable mark-recapture estimates or to justify the survey effort expended. Upper Nass River Chinook salmon Aggregate mark recapture estimates have achieved coefficients of variation (CV) less than or equal to 15% in 9 of 15 (60%) years since 1994 with the main factor determining CV being the number of marked Chinook salmon recovered or examined at terminal spawning areas in the Upper Nass River watershed. Recoveries of marked Chinook salmon at Meziadin fishway alone are not sufficient to generate sufficiently reliable mark recapture estimates for the Upper Nass River Chinook salmon Aggregate; hence, additional recovery efforts on other tributaries are required each year to achieve a 15% or lower CV.

In 2009, a mark-recapture experiment was conducted to estimate the abundance of Upper Nass River Chinook salmon Aggregate adult salmon returning to the Nass River. The mark-recapture study was designed to meet or exceed the data standard of a 15% or lower CV estimate and identify repeatable procedures for future estimates. Adult Chinook salmon were captured with two fishwheels operated on the lower Nass River near the village of Gitwinksihlkw from 1 June to 12 September and fish were individually marked with aluminum "chick-wing" tags applied to the left operculum. A total of 1,213 adult Chinook salmon were tagged and 1,692 fish were examined at upstream tributaries (of which 57 had been previously tagged). After accounting for tags removed by in-river fisheries and other tag associated losses, the adult abundance above Grease Harbour of medium-sized Chinook salmon (500-754 mm, tip of nose to fork of tail) was estimated to be 7,568 fish (SE=2,477; CV=35.5%) and abundance for large-sized (>754 mm) Chinook salmon was estimated to be 19,297 fish (SE=2629; CV=14.0%). Although mark rates were similar between medium- and large-sized Chinook salmon (3.2% vs. 3.4%, respectively), length distributions of Chinook salmon released with marks were significantly different than length distributions of adult Chinook salmon examined at the spawning grounds for marks (Kolmogorov-Smirnov test, Dmax = 0.112, $p<0.001$). As a result of this size selectivity, these separate mark-recapture estimates for medium and large-sized Chinook salmon were summed giving a total estimated abundance above Grease Harbour for adult Chinook salmon returning to the Upper Nass River of 26,864 (SE=5,106; CV=13.1%). This estimate was 2.1% smaller (~573 fish) than an estimate derived by pooling all size classes into a single mark-recapture estimate. Combining the in-river harvests (638) and escapement between Gitwinksihlkw and Grease Harbour (1,320) yielded an estimate of the total return of adult Chinook salmon to the Gitwinksihlkw fishwheels in 2009 of 31,289. The net escapement (spawners) estimate of adult Chinook salmon returning to the Upper Nass River in 2009 was 27,546 fish. A total of 726 Chinook salmon caught at the Gitwinksihlkw fishwheels were successfully aged; the most abundant age was five year olds (67%; all age 1.3), followed by four year olds (26%; age 1.2 =23.8% and age 0.3=2.2%), six year olds (5.4%; age 1.4=5.2% and age 2.3=0.2%) and three year olds (1.6%; age 0.2=1.0% and age 1.1=0.6%). The 2009 mark-recapture estimate for Upper Nass River Chinook Aggregate adult salmon achieved the data standard of 15% CV by mounting sufficient tag-recovery efforts to recover enough mark recoveries from the spawning grounds. The provision of $63,000 from the PSC was significant in allowing this additional survey effort. Initial recommendations for the future to consistently achieve the data standard and eliminate any spatial biases in tag recovery efforts would be to operate a third tagging fishwheel at Gitwinksihlkw to increase the mark rates of all size groups, continue tag recovery operations at Meziadin Fishway and the Kwinageese weir, and conduct carcass ground surveys at Damdochax Creek.